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NUTRITIONAL VALUE AND CHEMICAL QUALITY OF SOME FISH SPECIES

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ABSTRACT

Freshness is one of the most significant goals for fish quality. In the current study, evaluation of some chemical quality indices, as well as proximate composition, was carried out on some fish species in Egypt. A total of 100 samples from four different fish species; *Oreochromis niloticus* (Tilapia), *Bagrus bayed* (Bagrus), *Scomber scomber* (Mackerel), and *Latus niloticus* (Latus), 25 of each were collected from various markets in Assiut Governorate, Upper Egypt. The Overall acceptability of fish declared Bayad was the most fresh, while Mackerel achieved the lowest sensory scores. Results of pH, total volatile base nitrogen (TVBN) "mg N /100g", thiobarbituric acid reactive substances (TBARS)" mg MDA/kg", moisture%, protein%, fat%, and ash% were 6.20± 0.12, 14.79 ± 4.66, 0.32 ± 0.05, 81.27±1.87, 13.43±1.53, 3.87±0.57 and 0.19±0.03, respectively for Tilapia; 6.25±0.18, 12.75± 4.04, 0.31 ± 0.07, 78.69±2.99, 12.12±1.91, 8.57±2.01 and 0.21±0.04, respectively for Bagrus; 7.81±0.40, 34.06 ± 8.01, 1.26±0.18, 72.11±1.46, 18.09±1.53, 8.9±0.79 and 0.28 ± 0.05, respectively in Mackerel; 6.30±0.17, 14.51 ± 5.29, 0.27±0.08, 81.63±3.99, 16.13±2.31, 1.61±0.46 and 0.17 ± 0.04, respectively in Latus. In conclusion, *Latus niloticus* (Latus) showed better sensory and chemical characteristics, as well as high protein but low-fat content, being the better species of the examined fish.

Keywords: Tilapia, Bagrus, Latus, Mackerel, TVBN, TBA, PH, proximate composition.

INTRODUCTION

Fish are considered one of the food commodities traded worldwide they need to meet food safety and quality standards. (Mirza *et al*., 2023) After harvesting, chemical changes occur immediately and continue depending on how fish is handled and stored. Fish meat degradation is mostly caused by lipid oxidation and the activities of endogenous enzymes (lipases and proteases) (Walayat *et al.,* 2023). Fish quality was assessed through sensory evaluation and a few chemical procedures, such as measuring the pH value, which might serve as a freshness index (Otero-Tuárez *et al.*, 2018). Total Volatile Base Nitrogen (TVBN) is

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widely used to detect fish spoilage (Emilia *et al.*, 2016) and is commonly used as an indicator of fish quality. It is a very good way to measure the basic nitrogenous compounds, such as trimethylamine, dimethylamine, and ammonia, that are produced by fish-spoiling bacteria and autolytic enzymes, deamination of amino acids and nucleotide catabolites (Emilia *et al*., 2016). Also, the TBA index is a widely used biochemical quality indicator for assessing the level of lipid oxidation in food. Moreover, the TBA index is a popular biochemical quality for determining how much lipid oxidation is present in food. The TBA index provides a measurement of the malonaldehyde that is produced in muscle tissue as a result of lipid peroxide oxidation (Nakazawa and Okazaki, 2020).

A potential source of animal protein and essential elements for maintaining a healthy body in developing countries is fish (Fawole *et al*., 2007). The evaluation of fish's components of ash, protein, fat, and moisture is known as its "proximate composition." (Rani *et al*., 2016). The proximate composition of different fish species can be influenced by many parameters, including dietary composition, feeding and eating habits, feeding rate, age, size, sex, habitats, genetic features, season, and migration. (Begum *et al*., 2012).

The aim of the current work was the evaluation of sensory and physicochemical characteristics, as well as the proximate composition of four fish species samples *(Oreochromis niloticus "*Tilapia*", Scomber scomber "*Mackerel*", Bagrus bayad "*Bagrus *", and Latus niloticus"*Latus *"* obtained from different markets in Assiut.

MATERIALS AND METHOD

1. Collection and preparation of samples:

A total of 100 random samples of *Oreochromis niloticus "*Tilapia*"*, *Bagrus bayad "*Bagrus*", Scomber scomber "*Mackerel*"*, and *Latus niloticus"* Latus *"* (25 samples each) were collected from fish shops in Assiut City; all were in the fresh state except for Mackerel was frozen. The collected samples were transferred directly to the laboratory of the Meat Hygiene Section, Department of Food Hygiene, Safety and Technology, Faculty of Veterinary Medicine, Assiut University, in an ice box with a minimum delay, where they were prepared for chemical analysis. The samples were subjected to sensory assessment. The samples were then allowed to chill overnight at a temperature of 4°C till analysis the next day. The samples were cut separately into small pieces, and then thoroughly minced by a mincing machine to obtain a homogeneous mass.

2. Evaluation of physicochemical quality of fish samples.

2.1. Organoleptic examination according to (Fourati *et al.*, 2020)

Fish samples were examined at room temperature immediately after receipt. Using human senses: color, odor and taste were assessed. A group of 5 non-smoker panellists joined to judge samples in a description scale sheet prepared for grading the examined samples. A grade point was given for the quality of each sample, with the numerical value assigned to each factor.

2.2. Evaluation of physicochemical quality of fish samples through estimation of fish pH (Garavito *et al*., 2020), Total volatile basic nitrogen (TVB-N (EOS, 2017), and Thiobarbituric Acid-Reactive Substances (TBARS) (EOS, 2006).

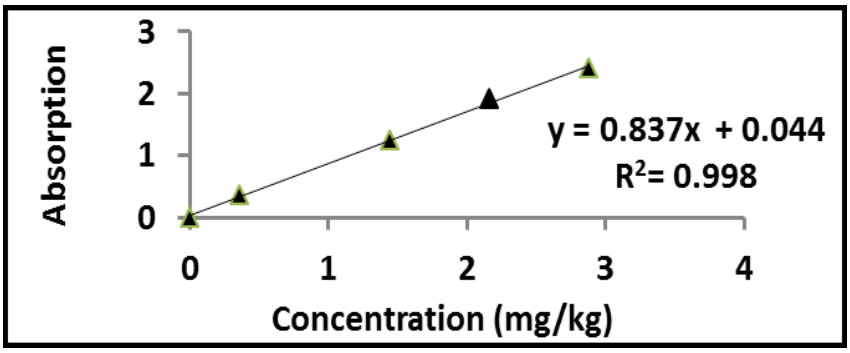

Figure (A): standard curve of TBARS

2.3. Determination of the proximate composition of fish through the determination of moisture content (AOAC, 2018), crude protein percentage "Biuret method" (Reichardt and Eckert, 1991), fat percentage, ether extract (AOAC, 2018), and ash content (AOAC, 2018).

3. Statistics: Statistical analysis of data was done with the GraphPad Prism software package for Windows version 9.5.1 (GraphPad-Software, LLC, USA). Descriptive statistics (maximum, minimum, mean, and standard deviation) were calculated. Comparative statistics were applied using one way ANOVA test, and the Kruskal-Wallis test was used to compare the mean values to assess whether there is a significant difference between the means. The "P" value of <0.05 was considered statistically significant (Lantz *et al*., 2016).

RESULTS

Table 1: Average score for the fish species samples' Overall acceptability (n = 25 for each).

Fish species	Overall acceptability
Bagrus bayad (Bagrus)	8.7 ^{a}±0.37
Latus niloticus (Latus)	8.28 ^{a}±0.49
Oreochromis niloticus (Tilapia)	8.58 ^{a}±0.52
Scomber scomber (Mackrel)	4.12 ^{b}±1.66

$^{a, b}$ mean values in the same column not share a common letter are differ significantly at P<0.05.

Table 2: Average values for the fish species physicochemical quality (pH, TVBN, TBARS) of fish samples (n = 25 each).

Fish species	PH	TVBN	TBARS
Bagrus bayad (Bagrus)	6.25 ^{a}±0.18	12.75 ^{a}±4.04	0.31 ^{a}±0.07
Latus niloticus (Latus)	6.30 ^{a}±0.17	14.51 ^{a}±5.29	0.27 ^{a}±0.08
Oreochromis niloticus (Tilapia)	6.20 ^{a}±0.12	14.79 ^{a}±4.66	0.32 ^{a}±0.05
Scomber scomber (Mackrel)	7.81 ^{b}±0.40	34.06 ^{b}±3.69	1.26 ^{b}±0.18

$^{a, b}$ mean values in the same column not share a common letter are differ significantly at P<0.05

Table 3: Average values for the fish species samples' proximate composition (moisture, protein, fat, and ash %) (n = 25 for each).

Fish species	moisture	protein	fat	ash
Bagrus bayad (Bagrus)	78.69^{b}±2.99	12.12^{b}±1.91	8.57 ^{a}±2.01	0.21 ^{b}±0.04
Latus niloticus (Latus)	81.63^{a}±3.99	16.13^{a}±2.31	1.61 ^{c}±0.46	0.17 ^{a}±0.03
Oreochromis niloticus (Tilapia)	81.27^{a}±1.87	13.43^{b}±1.53	3.87 ^{b}±0.57	0.19 $^{a\ b}$±0.03
Scomber Scomber (Mackerel)	72.11^{c}±1.46	18.09^{a}±1.53	8.9^{a}±0.79	0.28 ^{c}±0.05

$^{a, b, \text{and } c}$ mean values in the same column not share a common letter are differ significantly at $P < 0.05$

DISCUSSION

Organoleptic characters, chemical quality indicators (pH, TVB-N, and TBARS), and proximate composition analysis were used for the evaluation of fish quality.

1. Quality of fish samples based on their organoleptic characteristics.

Sensory analysis techniques have been developed to enable processors to optimize a product's color, odor, and taste to attract specific target audiences, as well as accurately monitor product quality (Bernardo et al. 2020). From the results achieved in Table (1), it is evident that the Overall acceptability of examined Bagrus fish samples were with a grade of " excellent" with a mean of 8.7±0.37. Followed by Tilapia and *Latus niloticus* samples, which had a "very good" grade in color, odor, and taste, with a mean of 8.58±0.52 and 8.28±0.49, respectively. The lowest grade was shown in Mackerel fish samples, which had a mean of 4.12±1.77 for each color, odor, and taste, respectively. There was a significant difference between Mackerel score and other examined fish species in each parameter of organoleptic characteristics. The obtained result could be attributed to mackerel freezing for a long time till it reaches the consumer while other species were fresh. As well mackerel is a fatty fish species. In Tilapia, these results were higher than those recorded by (Akullo *et al*., 2020 and Obasi and Danladi. 2023). Also, in Bagrus fish samples the scores of organoleptic characters were higher than the scores of (Obasi and Danladi. 2023). The sensory characteristics of Mackerel were lower than the results of (Mostafa *et al.*, 2023 and Obasi and Danladi. 2023). Moreover, the scores of the organoleptic parameters of *Latus niloticus* nearly resemble the score of (Abedelmaksoud *et al*., 2023) but are higher than the results of (Akullo *et al*., 2020).

2. Chemical quality indicator of fish samples.

2.1 pH values.

The pH is a remarkable intrinsic parameter related to fish meat that indicates freshness. The pH mean value of the examined Tilapia fish samples was 6.20± 0. 12, whereas, in Bagrus was 6.25±0.18. The mean value of pH in the Mackerel samples was 7.81±0. 40, and in *Latus niloticus* samples was 6.30±0.17. There was a significant difference between Mackerel pH and other examined fish species (Table 2)

In Tilapia, these results were nearly like results recorded by (Abouel-Yazeed, 2013 and Ibrahim *et al*., 2020). However, higher results were recorded by (Hossam *et al.*, 2011; Ghannam *et al.*, 2015; Abd-Allah and Ismail, 2016; Hussein *et al.*, 2022 and Mirza *et al.*, 2023). Meanwhile, lower results were recorded by (Khalafalla *et al*., 2015; Talab *et al*., 2016; Gerges *et al.*, 2016 and Talab *et al.*, 2023). In *Bagrus bayad* higher results were obtained by (Hossam *et al.*, 2011 and Abdel-Galil *et al*., 2023). While parallel results were recorded by (Ghannam *et al.*, 2015 and Ibrahim *et al.*, 2020). The results for Mackerel were nearly similar to the results recorded by (Mostafa *et al.*, 2023), but higher than results recorded by (Hussein *et al*., 2022;

Liang *et al*., 2023; and Panpipat *et al.*, 2023). Higher pH values in *Latus niloticus* were shown in studies by (Abedelmaksoud *et al.*, 2023 and Mponda and Kim, 2023), but lower values were recorded by (Elbarbary *et al.*, 2023).

The pH mean values of Tilapia, Bagrus, *and Latus niloticus* samples (6.2, 6.25, and 6.3) were accepted by (EOS, 2020) (6.5) but the pH mean values of Mackerel were unaccepted (7.81).

Postmortem pH values of most fish species ranged from 6.0 to 6.8 (Khalafalla *et al*., 2015). The differences in pH values reached from differences in the diet, species, seasons, type of muscle, and the stress level during fish catching or due to different bacterial contamination levels which lead to the formation of different levels of alkaline metabolites as TVB-N (Ibrahim *et al*., 2020).

2.2 TVBN values

Total volatile basic nitrogen (TVB-N) measures the degree of putrefaction, decomposition, and proteinase constituent breakdown in fish and fish products (Mostafa *et al*., 2023).

The data represented in Table (2) revealed that the TVB-N mean values (mg/100 g) of Tilapia, Bagrus, Mackerel, and Latus were 14.79 ± 4.66, 12.75± 4.04, 34.06 ± 3.69, and 14.51 ± 5.29, mg/100 g, respectively. There were significant differences between Mackerel and the other three examined species ($P<0.05$).

Nearly similar results for Tilapia were recorded by (Hossam *et al.*, 2011; Gerges *et al.*, 2016; Ibrahim *et al.*, 2020 and Talab *et al.*, 2023). However, lower results (10.38, 7.23±0.46, and 7.80 respectively) were obtained by (Abouel-Yazeed, 2013; Khalafalla *et al.*, 2015 and Mirza *et al.*, 2023). Meanwhile, higher results were recorded by (Ghanaam *et al.*, 2015; Abd-Allah and Ismail, 2016 and Talab *et al.*, 2016). In Bagrus close results were recorded by Ibrahim *et al.*, (2020). Higher results were represented by (Ghannam *et al.*, 2015), but lower results were found by (Hossam *et al.*, 2011). As for *Latus niloticus*, lower results were identified by (Okeyo *et al*., 2009). While in Mackerel the results were nearly like those recorded by (Orngue *et al.*, 2021 and Hussein *et al*., 2022). But lower results were recorded by (EL-Dengawy *et al*, 2017; Park *et al.*, 2021and Mostafa *et al.*, 2023).

TVBN of Tilapia, Bagrus, and Latus samples (14.79, 12.75, and 14.51 mg/100 g) were accepted with (EOS, 2020) (30 mg/100 g), but TVBN mean values of Mackerel were unaccepted (34.06).

TVB-N is associated with the breakdown of proteins and non-protein nitrogenous components by proteolytic and microbial enzymes with the production of volatile amines as well as ammonia. It has been proposed that TVN measurement has the potential to replace microbial and/or sensory analyses to determine fish freshness, due to the positive relation between TVBN content and counts of spoilage microorganisms (Dini *et al.*, 2020) and (Teklemariam *et al*., 2015). The accumulation of volatile amines plays a higher role in losing fish product quality due to the unpleasant odors combined with the product degradation. During spoilage, increasing the TMA (trimethyle amine) content leads to an increase in the TVB-N content (Jinadasa, 2014).

2.3. TBARS values.

The degree of lipid oxidation in food products is determined by the TBARS test for evaluating the chemical alterations brought on by the storage process is a chemical that causes secondary oxidation. The accumulation of secondary oxidation products, quantified as mg malonaldehyde/ kg of flesh was used to express the TBARS (Nakazawa and Okazaki, 2020; Ortiz *et al*., 2013).

The results reported in Table (2) showed the TBARS (mg MDA/kg) values of examined fish samples. The TBARS mean value of Tilapia samples was 0.32 ± 0.05 mg MDA/kg. In Bagrus fish samples, the mean value was 0.31 ± 0.07 mg MDA/kg. Moreover, in Mackerel and Latus samples,

the mean values were 1.26 ± 0.18 and 0.27 ± 0.08 mg MDA/kg, respectively.

There were significant differences (P<0.05) among the examined Tilapia, Bayad, Latus and Mackerel samples. This may be explained by different handling, storage, or preservation of species and different catching environments. All examined samples were accepted in TBARS according to (EOS, 2020) (4.5 mg MDA/kg). The TBARS results in the examined Tilapia samples were nearly similar to the results of (Akullo *et al*., 2020); but lower than those obtained by (Abouel - Yazeed, 2013; Ghannam *et al*., 2015; Abd-Allah and Ismail, 2016; Talab *et al.,* 2016; Gerges *et al*., 2016; Ibrahim *et al.,* 2020; Hussein *et al*., 2022 and Talab *et al.,* 2023). Means were higher than (Khalafalla *et al.,* 2015 and Babak *et al*., 2018). In *Bagrus bayad* samples the results of TBARS were lower than those found by (Ghannam *et al.,* 2015 and Ibrahim *et al*., 2020). Regarding Mackerel, TBARS results obtained by (Park *et al*., 2021; Hussein *et al.,* 2022 and Mostafa *et al.,* 2023) were higher than the result of our study. The TBARS value in *Latus niloticus* was close to the results of (Akullo *et al*., 2020 and Abedelmaksoud *et al*., 2023), but lower than (Elbarbary *et al*., 2023) who recorded a TBARS mean value of 0.43 ±0.002 in fresh latus fish.

3. Proximate composition analysis:

The nutritional profile, which is derived from the proximate components of fish flesh, provides an initial indication of the fish's commercial criteria as needed by food regulations (Marichamy *et al.,* 2012).

3.1. Moisture content:

Food's moisture content serves as a reliable gauge of its calorie, protein, and fat content. Fish with less moisture have more fat and protein in them, as well as more calories per unit (Barua *et al.,* 2012).

The data represented in Table (3) revealed the mean values of moisture % in Tilapia, *Latus niloticus, Bgrus bayad,* and Mackerel were 81.27±1.87, 81.63±3.99, 78.69±2.99 and 72.11±1.46, respectively. In Tilapia, the results were nearly like results declared by (Ghannam *et al*., 2015; Talab *et al*., 2016; Idam *et al*., 2023 and Mirza *et al.,* 2023) but higher than the results recorded by Abd-Allah and Ismail, 2016; Akullo *et al*., 2020; Isam *et al*., 2021; Yagoub, 2022; Talab *et al*., 2023; Al-Taee *et al.,* 2022 and Alaa *et al.,* 2024). In *Bagrus bayad*, the values were close to results of (Isam *et al.,* 2021 and Malik *et al*., 2021). However, were lower than (Alaa *et al*., 2024) and higher than results recorded by (Ghannam *et al*., 2015). In *Latus niloticus* the results were nearly like those recorded by (Alaa *et al*., 2024), but higher than (Okeyo *et al*., 2009; Akullo *et al*., 2020; Malik *et al*., 2021;Isam *et al*., 2021and Abdelmaksoud *et al*., 2023). In Mackrel, the mean value was close to results recorded by (Sonavane *et al*., 2017 and EL-Dengawy *et al*., 2017), but lower than (Nisa and Asadullah, 2010; ALkuraieef *et al.,* 2022 and Mostafa *et al*., 2023) and higher than (Orngue *et al.,* 2021).

3.2. Protein content:

Fish protein has been considered to have a high nutritional value and has immense beneficial health effects in human nutrition (Khalili Tilami and Sampels, 2018). Among the excellent quality animal protein sources, fish are good sources of essential nutrients, easy digestibility, and high-quality amino acid composition (Olopade *et al.,* 2016; Jim *et al*., 2017 and Desta *et al*., 2019)

The data represented in Table (3) revealed the mean values of protein in Tilapia, *Latus niloticus, Bagrus bayad, and* Mackerel were 13.43±1.53, 16.13±2.31, 12.12±1.91 and 18.09±1.53, respectively. In Tilapia, these results were nearly the same as those recorded by (Mirza *et al*., 2023), but lower than those recorded by (Ghannam *et al.,* 2015; Abd-Allah and Ismail, 2016; Talab *et al.,* 2016; Akullo *et al*., 2020; Isam *et al* ., 2021; Malik *et al*., 2021; Yagoub, 2022; AL-Taee *et al*., 2022; Idam *et al* ., 2023; Talab *et al.,* 2023 and Alaa *et al.,* 2024). In *Latus niloticus* the results were lower than those mentioned by (okeyo *et al.,* 2009; Akullo *et al*., 2020; Isam *et al*., 2021; Malik *et al*., 2021; Abdelmaksoud *et al.,* 2023 and Alaa *et al*., 2024). In *Bagrus bayad* the results were

lower than values declared by (Ghannam *et al.*, 2015; Malik *et al*., 2021; Isam *et al*., 2021, and Alaa *et al*., 2024). In Mackrel, the results were nearly similar to values recorded by (Nisa and Asadullah, 2010; Sonavane *et al*., 2017; Orngu *et al*., 2021; ALkuraieef *et al*., 2022 and Mostafa *et al.*, 2023). But higher than the results recorded by (EL-Dengawy *et al*., 2017) who found a protein mean value of 15-18% in frozen mackerel samples.

3.3. Fat content:

The third principal constituent in fish muscle is fat and it ranges from 6 % to 20 %, primarily located in the subcutaneous tissue, mesenteric tissue, liver, muscle tissue, head, and belly flap. (Moradi *et al.*, 2011). Fish is a rich source of long−chain omega−3 polyunsaturated fatty acids (PUFAs) and minerals essential for maintaining a healthy body, as they serve as important components in the reduction of some risk factors associated with arteriosclerosis and heart disease (Ram *et al.*, 2018 and Ullah *et al*., 2022)

The data represented in Table (3) showed the mean value of fat% in Tilapi*a, Latus niloticus, Bagrus bayad,* and Mackerel were 3.78±0.57, 1.61±0.46, 8.58±2.01 and 8.9±0.79, respectively. In Tilapia, the result is nearly like that found by (Akullo *et al*., 2020) ″2.13±1.3″ and (Yagoub, 2022) ″3″. In contrast, the results were lower than those recorded by (AL-Taee *et al.*, 2022) and higher than the results declared by (Ghannam *et al*., 2015; Abd-Allah and Ismail, 2016; Talab *et al*., 2016; Malik *et al*., 2021; Isam *et al*., 2021; Idam *et al*., 2023; Talab *et al.*, 2023; Mirza *et al*., 2023 and Alaa *et al*., 2024). In *Latus niloticus* the obtained results were close to the results of (Alaa *et al*., 2024), but higher than those of (Okeyo *et al*., 2009; Isam *et al.*, 2021; Malik *et al*., 2021 and, Abbdelmaksoud *et al*., 2023) and lower than that recorded by (Akullo *et al*., 2020).

In *Bagrus bayad*, the results were higher than those recorded by (Ghannam *et al.*, 2015; Isam *et al.*, 2021; Malik *et al*., 2021 and Alaa *et al*., 2024). Furthermore, in Mackrel the results are nearly like results recorded by (EL-Dengawy *et al*., 2017and Sonavane *et al.*, 2017); but higher than the results of (Alkuraieef *et al.*, 2022; Mostafa *et al.*, 2023) and (Nisa and Asadullah, 2010); and lower than that recorded by (Orngue *et al*., 2021).

3.4. Ash content:

The residue that is left over after all of the organic material has burned away is called ash (Adewumi *et al.*, 2014). Ash content, which is a measurement of the mineral makeup of all food, including fish, is affected by a variety of variables, including the water's biological, physicochemical, and seasonal characteristics at the time of fishing (Akande and Faturoti, 2005).

The data represented in Table (3) revealed the mean values of ash% in Tilapia, *Latus niloticus, Bagrus bayad,* and Mackerel were 0.19±0.03, 017±0.03, 0.21±0.04 and 0.28±0.05, respectively.

In Tilapia, the result was nearly similar to the results recorded by (Idam *et al.*, 2023) ″0.2″. Meanwhile, higher results were found (Ghannam *et al.*, 2015; Talab *et al*., 2016; Abd-Allah and Ismail, 2016; Akullo *et al.*, 2020; Malik *et al*., 2021; Isam *et al*., 2021; Talab *et al.*, 2023; AL-Taee *et al*., 2023; Mirza *et al*., 2023; Alaa *et al*., 2024and Yagoub, 2022). In *Latus niloticus* (Okeyo *et al*., 2009; Akullo *et al*., 2020; Malik *et al*., 2021; Isam *et al*., 2021; Abdelmaksoud *et al.*, 2023 and Alaa *et al*., 2024) also recorded higher ash content. As well in *Bagrus bayad* (Ghannam *et al*., 2015; Malik *et al*., 2021; Isam *et al*., 2021 and Alaa *et al*., 2024) detected higher values of 1.15± 0.01, 1.03, 1.03, and 0.97, respectively. Moreover, in Mackerel (Nisa and Asadullah, 2010; EL-Dengawy *et al*., 2017; Sonavane *et al*., 2017; Orngue *et al*., 2021; ALkuraieef *et al.*, 2022; and Mostafa *et al*., 2023) estimated higher ash content of ″1.28, 3.14, 1.42, 1.33, 1.26, 1.26, ″respectively.

Fish chemical composition can be influenced by a variety of factors, including species, environmental conditions, fish size, the amount of protein in the diet, and feeding rate. (Ogata and Shearer, 2000).

CONCLUSION

Sensory and chemical assessment is very important for the evaluation of fish freshness as consumers become more concerned about the quality of fish and food. The quality of the fish at the fish markets in Assiut was different. According to the sensory and chemical quality indices, the results analyzed showed that *Latus niloticus* had the best sensory and chemical quality indices among the species that have been inspected while mackerel showed the lowest significant characteristic. As well, *Latus niloticus* (Latus) showed high protein but low fat. The present study's findings regarding proximate composition revealed significant differences (P >0.05) between the studied fish species.

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القيمة الغذائية والدلائل الكيميائية لبعض انواع السمك

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أجريت هذه الدراسة لتقييم الصفات الحسية (اللون ,الرائحة و الطعم) والدلائل الكيميائية (قياس الأس الهيدروجيني وقياس القواعد النيتروجينية الكلية الطيارة وقيم المواد المتفاعلة مع حمض الثوباربيتيوريك) , القيمه الغذائيه (الرطوبة والبروتين والدهون والرماد) لـ ١٠٠ عينة عشوائية من أسماك البلطي و قشر البياض والبياض والماكريل (٢٥ عينة لكل منها) تم تجميعها من محلات الأسماك في محافظة أسيوط. وأظهرت نتائج التقييم الحسي أن البياض كان الأكثر طازجيه بينما كان الماكريل الأقل قيما وقد اوضحت نتايج الدلائل الكيميائية للعينات ان جميع عينات البلطي وقشر البياض والبياض هي مقبولة ومتطابقة مع المواصفة القياسية المصرية للأسماك والنتائج كالأتي :٦,٢٠±٠,١٢, ١٤,٧٩±٤,٦٦, ٠,٣٢ ±٠,٠٥, للبلي علي التوالي ٦,٣٠±٠,١٧, ١٤,٥١±٥,٢٩, ٠,٢٧±٠,٠٨ لقشر البياض علي التوالي , ٦,٢٥±٠,١٨, ١٢,٧٥±٤,٠٤, ٠,٣١±٠,٠٧ للبياض علي التوالي لقيم الأس الهيدروجيني , القواعد النيتروجينية الكلية اطيارة , و قيم المواد المتفاعلة مع حمض الثوباربيتيوريك علي التوالي أما بالنسبة لعينات الماكيريل تم رفضه حسب المواصفات القياسية المصرية ونتائجه كالأتي٧,٨١±٠,٤٠, ٣٤,٠٦±٣,٦٩, ١,٢٦±٠,١٨علي التوالي .

كانت نتائج القيمة الغذائيه (٪) لقيم الرطوبة , البروتين , الدهون ,و الرماد كالاتي :

٨١,٢٧±١,٨٧و١٣,٤٣±١,٥٣و٣,٨٧±٠,٥٧و٠,١٩±٠,٠٣ لعينات البلطي علي التوالي
٨١,٦٣±٣,٩٩, ١٦,١٣±٢,٣١,١,٦١±٠,١٧,٠,٤٦±٠,٠٣ لعينات قشر البياض علي التوالي
٧٨,٦٩±٢,٩٩,١٢,١٢±١,٩١,٨,٥٧±٠,٢١,٠٠,٢,٠١±٠,٠٤ لعينات البياض علي التوالي
٧٢,١١±١,٤٧,١٨,٠٩±١,٥٣,٨,٩±٠,٢٨,٠,٧٩±٠,٠٥ لعينات الماكريل علي التوالي

وقد لوحظ أن عينات اسماك قشر البياض كانت الأفضل من حيث الصفات الحسية والقيمة الغذائية .