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Study the Effect of Aqueous Extract of Alfalfa a and Clove as Natural Antioxidant on Some Meat Quality Characteristics in Common Carp *Cyprinus carpio*

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Abstract

Dried clove powder (*Eugenia caryophyllata*) was acquired from a local traditional market, while alfa *(Medicago sativa*) was obtained from natural farming. Aqueous extracts of both cloves and Alfalfa powder were prepared using a Soxhlet apparatus, and the extracts were subsequently freeze-dried. These extracts were employed as natural antioxidants. Common carp (*Cyprinus carpio* L.) were purchased from a local market and transported alive to the laboratory. After chilling for 24 hours, fish fillets were removed from the refrigerator and cut into uniform pieces (3×3×3 cm). These pieces were randomly assigned to four treatments for each additive. Fish samples were immersed in 100 ml of antioxidant solution at concentrations of 0% (control), 0.5%, 1%, 1.5%, and 2% of clove, Iranian alfalfa, and local alfalfa extract solutions, respectively, and left at room temperature for one hour. The control treatment (T1) without any supplements showed significantly higher levels of lipid oxidation and pH compared to the other treatments. The addition of 2% clove significantly affected moisture%, showing the lowest value, while significantly increasing water holding capacity%. Compared to the other treatments, the control and Iranian Alfalfa treatments had a significantly higher cooking loss percentage. The control treatment also showed significantly higher Mb (myoglobin) and Met-Mb% (metmyoglobin) compared to the other treatments. There were no significant differences ($p<0.01$) observed in terms of flavour, tenderness, or overall acceptability. In terms of fish meat color, Iranian Alfalfa and the control treatment were significantly higher ($p<0.01$).

Keywords: Alfalfa, Clove, meat quality, *Cyprinus carpio* L.

Introduction

Freshwater fish is recognized as a nutritious option because of its high protein content, balanced amino acid profile, moderate levels of healthy fats, and lower n-3 Polyunsaturated Fatty Acid (PUFA) content compared to marine fish. It is also a good source of essential minerals. Common carp, for example, contains protein ranging from 47.3% to 76.4% of its dry weight, with its fatty acid composition primarily consisting of Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA). The fatty acid composition of carp is influenced by both external and internal factors. Researchers found that seasonal variations, an external factor, did not significantly affect the fatty acid content of carp. However, diet and feeding habits are believed to play a role in determining the composition and quantity of fatty acids in carp meat (1). Fish has long been considered a fundamental source of animal protein. If fish bones were not so delicate, archaeology would likely rank fish more highly among prehistoric foods. Fish is rich in protein, polyunsaturated fatty acids (PUFA), vitamins, and minerals for human consumption. It contains high levels of PUFA, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are particularly abundant. These fatty acids are highly susceptible to peroxidation and readily become part of the lipid peroxidation mechanism, producing free radicals and lipid peroxy radicals. (1).

In the food industry, there is a growing preference for using natural or naturally derived antioxidants over synthetic ones to enhance the shelf life and safety of food products. One group of active molecules that has garnered significant interest for this purpose is phenols obtained from fruits, vegetables, and food processing by-products. Grape skins and seeds, known as pomace, are particularly valuable among these by-products. They offer a rich source of various high-value products such as ethanol, tartrates, malates, citric acid, grape seed oil, hydrocolloids, and dietary fiber, which are increasingly utilized to develop functional ingredients. Grape extracts are known for their expected high content of proanthocyanidins (2).

Many herbs and spices could slow down the oxidation of lipids during food storage, typically due to the natural antioxidant properties of their components. The use of natural antioxidants in the food industry has been rapidly increasing, leading to a surge in related studies (3).

Alfalfa (*Medicago sativa*) is a flowering plant belonging to the pea family (Fabaceae), and it is cultivated as a significant forage crop. It is known as Lucerne in the United Kingdom, Australia, New Zealand, and lucerne grass in South Asia. Globally, people grow alfalfa as cattle forage due to its high protein content. In ancient Chinese medicine, young alfalfa leaves were used by physicians to treat digestive tract and kidney disorders. Several forage legumes, with alfalfa being the most prominent, offer ruminants a vital source of proteins and other essential nutrients. Numerous studies have shown that the quality of alfalfa plants diminishes as they age, with the proportion of stem increasing

at the expense of leaves in the total forage yield.

The clove pink, also known as Carnation, belongs to the *Dianthus* species. Clove, a globally recognized spice and herb, is named after the Latin word for "nail" due to its resemblance to small-sized nails. Clove is extensively used for both medicinal and culinary purposes. Cloves are the unopened flower buds of the evergreen tree *Eugenia caryophyllus*, which belongs to the Myrtaceae family. This tree is native to the Moluccas, part of Indonesia (4). There is a growing inclination to substitute synthetic antioxidants in food processing with natural oxidation inhibitors or ingredients that inherently possess antioxidant properties. Thus, the main goal of this study was to determine if adding extracts of clove buds and alfalfa leaves could slow down both lipid and protein oxidation, thereby prolonging the shelf life of common carp (*Cyprinus carpio* L.) fillets. Furthermore, this research aimed to shed light on the potential of clove bud and alfalfa leaf extracts as natural and efficient sources of antioxidants for fish processing.

Materials and Methods

Dried clove powders (*Eugenia caryophyllata*) were purchased from a local traditional market, and Alfalfa (*Medicago sativa*) from the natural farming of alfalfa seeds in Peramagrun, after drying their leaves mincing them to powder.

Preparation of plant extracts: In the case of aqueous extract, 50 g of cloves and Alfalfa powder were added to 500 ml of boiled distilled water in an enclosed bottle and left for 24 h at room temperature with constant shaking; the extract was obtained by filtration through Whatman No. 1 filter paper. The extract was collected in a separate bottle. The filtrates were concentrated by rotary evaporator Soxhlet apparatus, and the extracts were freeze. and dried extracts were placed in sealed bottles and stored at 4◦C before use. These extracts were used as natural antioxidants.

Preparation of fish sample: Common carp *C. carpio* L. were purchased from a local market and were transported alive to the laboratory. The fresh common carp were slaughtered, scaled, gutted, and washed in cold water, and filtered, then packed in polyethylene bags and stored in the refrigerator at 4 ^{0}C for 24 hours. After 24-hour chilling, fish filets were taken out of the refrigerator and cut into pieces of the same size (3×3×3 cm), and were randomly allotted for four (4) treatments for each additive.

Fish samples were immersed in 100 ml of antioxidant solution at concentrations of %0 (control), %0.5, %1, and %1.5 and 2% of clove, Iranian alfalfa, and local alfalfa extract solution, respectively, then left at room temperature for one hour. The samples were removed from antioxidant solutions, patched in polyethylene bags, stored in refrigeration at 4^{0}C for 48 hr, then kept in freezing at -18 °C until analysis.

Studied characteristics

Physical analysis

Cooking loss: Twenty gram of flesh specimens were taken and placed in closed aluminum boxes and cooked for 15 min in an oven pre-heated at 200ºC. After cooking, the specimens were dried with a paper towel. Total cooking loss was estimated on each specimen (cooled for 30 min to 15°C) as a percentage ratio between cooked and raw weight (5).

Water Holding Capacity (WHC): Dolatowski and Stasiak (6) described the method to determine the WHC, which involved removing 50 g from the studied muscle, homogenizing it with 50 ml of distilled water for one minute using a homogenizer, and then centrifuging the mixture at a speed of 5000 x g for 10 minutes at 4ºC.The water holding capacity percentage WHC was calculated as follows:

$$WHC\% = \frac{Added\ Water\ Weight - Water\ Weight\ After\ CF}{Sample\ Weight} \times 100$$

Note: CF is centrifugation.

pH: 10grams were homogenized with 50ml of distillated water then filtered through whatman no.1 filter paper. pH of the filtrate was measured using digital pH meter.

Chemical and biochemical analysis:

Lipid oxidation (TBA): Thiobarbituric acid (TBA) value analysis: Twenty grams of fish meat were full speed blended for 1-5 min in a blender with 50ml of the extraction solution containing 20% trichloroacetic acid in 2M phosphoric acid. The resulting slurry was transferred quantitatively to the 100-ml volumetric flask with 40-ml distilled water. The sample was diluted to 100-ml with distilled water and homogenized by shaking by hand. A 50-ml portion was filtered through Whatman No. 1 filter paper. 5 ml of filtrate was transferred to a test tube, followed by adding 5 ml of thiobarbituric acid (0.005 M in distilled water). The tube was then stored in a dark place for 15 hr. at room temperature. The resulting color was measured using spectrophotometer at absorption spectrum 530 nm **(**8 as adopted by 9).

TBA values as mg malonaldehyde/ kg were calculated by multiplying absorbance value of sample by 5.2.

Meat color (Mb):

Sensory evaluation

The fish meat fillet specimens were placed in open aluminum boxes and evaluated for sensory attributes (color, flavor and aroma, tenderness, juiciness, and overall acceptability). The samples cook in oven at 176˚C for 8.5 min until reaching the internal temperature of 70˚C, then serve warm at 60˚C to eight trained panelists (Murphy and Zerby, 2004). Muscle samples from different treatments are evaluated in each session. The sample order is random within the session. After each sample assessment, water is used.Panelists rated each sample for different attributes with five point scales ranging between 1 and 5.

Statistical analysis

The statistical analysis system (SAS Institute, 2010), General linear model (GLM) with SAS program (SAS,2010), and

Factorial Complete Randomized Design (CRD) were used to study the effect of treatments on studied traits. Duncan's multiple range test (Duncan, 1955) was used to determine significant differences among means.

Results And Discussion

Plant derived polyphenols are known to be prone to complex with proteins. Many phenolic-rich extracts have intense characteristic odors, bitter tastes, and distinct colors, which adversely affect the sensory properties of food products.

Figure 4 shows that T1 (the control group) that didn't get any supplements had much higher levels of thiobarbituric acid (TBA) and pH than the other groups.

Table 4: Effect of clove, local and Iranian alfalfa on TBA (mg MDA/ kg meat and pH of common carp *Cyprinus carpio* L.

Treatment	**TBA** **mg MDA/ kg meat**	**pH**
T1 (control)	1.699 a	5.500 a
Clove (0.5%)	0.585 bc	5.745 bc
Clove (1%)	0.553 bc	5.81 d
Clove (1.5%)	0.539 bc	5.85 d
Clove (2%)	0.510 c	5.94 e
Local Alfalfa (0.5%)	0.796 def	5.685 fg
Local Alfalfa (1%)	0.785 ef	5.705 cfg
Local Alfalfa (1.5%)	0.707 fg	5.730 bcf
Local Alfalfa (2%)	0.644 bg	5.760 b
Iranian Alfalfa (0.5%)	0.985 h	5.575 g
Iranian Alfalfa (1%)	0.954 h	5.585 g
Iranian Alfalfa (1.5%)	0.900 dh	5.615 gh
Iranian Alfalfa (2%)	0.822 de	5.660 gh
Standard deviation	0.03	0.02

Means with different letters among treatments within columns are significantly different at (p<0.01).

The pH is the only measurement which has been commonly used as a physical method for quality assessment of fish meat (10) and it ranged between 6.4 and 7.0. The perfect quality product (3.00 mg malonaldehyde/ kg) while good quality product should not be more than 5mg malonaldehyde/kg (11) and these agree with our results.

It was reported that TBA values of some local fish types in Basrah /Iraq included fresh Suboor *Hilsa Illisha*, Jaffout *Nematalosa nasus*, and mullet (*Planiliza subviridis* were 3.201, 1.294, and 0.551 mg malonaldehyde/kg respectively (12).

This resembles the results of the current study. The results may differ depending on the amount of lipid content; the local Egyptian fresh (*Lethrinus elongatus*) recorded TBA value as 0.163mg N/100gm (13).

No significant ($P < 0.05$) differences were observed in the body moisture, fat and gross energy contents of fish fed either 15 or 20% of alfalfa meal. Adding of Clove (2%) affects significantly each of Moisture% by being the lower value significantly and in opposite to it the Water Holding Capacity%, which was the higher significantly. As shown in Table (5), the cooking loss percentage was significantly higher for the control and Iranian alfalfa treatments compared to the other treatments. In common carp, Buyukcapar & Kamalak (14) reported that the lipid range was between 9.5 and 13.3%. The researchers found that the moisture contents in Oreochromis mykiss and Tilapia muscles were 72.2 and 76.7%, respectively (15).

These results agree with what Aljobair (16) found. He said that cookie flour with clove powder had a significant increase ($P \leq .05$) in a number of characteristics, such as peak viscosity, breakdown, final viscosity, setback, hardness, cohesiveness, springiness, adhesiveness, chewiness, water holding capacity, and oil holding capacity compared to the control. Additionally, the incorporation of clove powder in cookies significantly ($P \leq .05$) increased diameter, thickness, hardness, factorability, redness, and moisture.

It is thought that low pH has effects on WHC; it alters the functional properties and denatures the myofibril proteins and it may be related to higher proteins content. Water holding capacity (WHC) value of local fresh fish meats in (Lethrinus elongatus) was 5.5% (13) and may be related to the differ fish species. The control significantly outperformed the other treatments in terms of Mb (mg/gm meat) and Met-Mb%, as shown in Table (6).

Table 5: Effect of clove, Local and Iranian alfalfa on Moisture, Water Holding Capacity %, and cooking loss % of common carp *Cyprinus carpio* L.

Treatment	Moisture %	Water Holding Capacity %	Cooking loss %
T1 (control)	66.407 ± abc	45.250 ± g	52.500 ± a
Clove (0.5%)	75.658 ± d	63.750 ± b	30.804 ± bc
Clove (1%)	77.533 ± de	66.250 ± b	30.222 ± c
Clove (1.5%)	77.975 ± de	70.000 ± c	29.288 ± c
Clove (2%)	80.725 ± e	75.000 ± a	26.437 ± d
Local Alfalfa (0.5%)	66.289 ± abc	53.750 ± de	37.735 ± e
Local Alfalfa (1%)	68.815 ± ab	56.250 ± df	36.439 ± ef
Local Alfalfa (1.5%)	69.353 ± a	58.75 ± f	35.012 ± fg
Local Alfalfa (2%)	74.143 ± d	65.000 ± b	33.155 ± bg
Iranian Alfalfa (0.5%)	62.941 ± c	46.700 ± g	50.1 ± ah
Iranian Alfalfa (1%)	65.060 ± bc	47.500 ± g	48.820 ± h
Iranian Alfalfa (1.5%)	66.189 ± abc	48.750 ± g	45.598 ± i
Iranian Alfalfa (2%)	68.938 ± ab	52.500 ± e	40.477 ± j
Standard deviation	0.07	0.02	0.05

Means with different letters among treatments within columns are significantly different at ($p<0.01$).

Higher moisture content, improved water holding capacity, and a decrease in the percentage of free water can all contribute to the meat's reduced cooking loss.These factors enhance the meat tissue's ability to retain water, reducing losses during cooking. The cooking loss is also influenced by the protein percentage, and a lower pH value can further affect it by denaturing proteins under acidic conditions (pH values were 6.612 and 6.605 for Silver and Common carp, respectively). The determination of water holding capacity (WHC) and cooking loss impacts the extent of protein denaturation and, consequently, the overall quality of the fish (17). Differences in feed availability could be the cause of the variation in post-rigor pH levels. In intensive farming, fish have unrestricted access to feed, resulting in high muscle glycogen levels.In intensive farming, fish have unrestricted access to feed, resulting in high muscle glycogen levels. This, in turn, leads to a low ultimate muscle pH post-rigor, as glycogen undergoes anaerobic degradation after slaughter (18).

Table (6): Effect of clove, Local and Iranian alfalfa on some meat color indices of common carp *Cyprinus carpio* L.

Treatment	Mb (mg/gm meat)	Met-Mb %
T1 (control)	0.117 ± a	65.730 ± a
Clove (0.5%)	0.193 ± b	47.625 ± b
Clove (1%)	0.205 ± b	46.137 ± b
Clove (1.5%)	0.236 ± c	43.177 ± c
Clove (2%)	0.251 ± d	41.564 ± c
Local Alfalfa (0.5%)	0.153 ± e	60.456 ± d
Local Alfalfa (1%)	0.162 ± f	56.954 ± e
Local Alfalfa (1.5%)	0.173 ± g	53.135 ± f
Local Alfalfa (2%)	0.183 ± h	51.461 ± f
Iranian Alfalfa (0.5%)	0.134 ± i	65.371 ± ag
Iranian Alfalfa (1%)	0.140 ± ij	63.682 ± gh
Iranian Alfalfa (1.5%)	0.145 ± ej	62.028 ± hi
Iranian Alfalfa (2%)	0.148 ± ej	61.884 ± hi
Standard deviation	0.02	0.06

Means with different letters among treatments within columns are significantly different at (P<0.01).

The inclusion of fiber notably enhanced the cooking yield. The results show that as the amount of fiber added increased, so did the cooking yield, ranging from 80% in the sample without grape to 89% with 4% fiber throughout the experiment. These findings align with previous reports by the authors regarding fish muscle (19). These results are also consistent with previous reports by the authors (19), when wheat fiber was added and with the present results.

No significant differences at ($p<0.01$) observed in each of Flavored (Aroma), Tenderness and Overall acceptability as shown in table (7), Iranian Alfalfa and control were higher significantly at ($p<0.01$) in fish meat Color, different significance appeared among all treatments at ($p<0.05$) in Juiciness.

Table (7): Effect of clove, Local and Iranian alfalfa on organoleptic (Sensory) evaluation of common carp *Cyprinus carpio* L.

Treatment	Color	Flavored (Aroma)	Tenderness	Juiciness	Overall acceptability
T1 (control)	2.600 ± a	3.00 ± a	3.40 ± a	2.80 ± A	2.60 ± a
Clove (0.5%)	4.40 ± bc	3.60 ± a	4.20 ± a	3.40 ± AB	3.60 ± a
Clove (1%)	4.40 ± bc	3.60 ± a	4.20 ± a	3.40 ± AB	3.80 ± a
Clove (1.5%)	4.60 ± bc	4.20 ± a	4.20 ± a	4.20 ± BC	4.00 ± a
Clove (2%)	4.80 ± b	4.40 ± a	4.20± a	4.60 ± C	4.40 ± a
Local Alfalfa (0.5%)	3.60 ± cd	3.40 ± a	4.00 ± a	3.40 ± AB	3.40 ± a
Local Alfalfa (1%)	3.80 ± bcd	3.40 ± a	4.00 ± a	3.4± AB	3.40 ± a
Local Alfalfa (1.5%)	3.80 ± bcd	3.60 ± a	4.00 ± a	3.4 ± AB	3.6 ± a
Local Alfalfa (2%)	3.80 ± bcd	3.60 ± a	4.00 ± a	3.4 ± AB	3.6 ± a
Iranian Alfalfa (0.5%)	2.8 ± ad	3.0 ± a	3.6 ± a	3.0 ± A	3.4 ± a
Iranian Alfalfa (1%)	3.0 ± ad	3.2 ± a	3.6 ± a	3.2 ± AB	3.4 ± a
Iranian Alfalfa (1.5%)	3.2 ± ad	3.2 ± a	3.8 ± a	3.2 ± AB	3.4 ± a
Iranian Alfalfa (2%)	3.6 ± acd	3.2 ± a	3.8 ± a	3.2 ± AB	3.4 ± a
Standard deviation	0.01	0.04	0.09	0.05	0.07

Means with different small letters among treatments within columns are significantly different at ($p<0.01$). Means with different capital letters among treatments within columns are significantly different at ($p<0.05$).

Sensory evaluation, in conjunction with analytical and affective testing, provides the most accurate estimate of how long the product will maintain acceptable quality, freshness, and expiration assurance (20). According to Abdulrahman's findings (21), adding grape seed has a considerable impact on the percentage of protein, fat, and ash in fish flesh. There were no discernible variations in the organoleptic assessment across all treatments, which is consistent with the current findings.

The most common method of determining how fresh fish is is by sensory evaluation; this method is quick, easy, and yields high-quality information right away. The sensory aspects are readily apparent to the customer and critical to their enjoyment. Accordingly, it makes sense that customers have an impact on the quality of fresh fish based on how satisfied they are and that consumers anticipate a product that is safe and has a good look, odour, taste, and texture (22; 23); otherwise, fresh fish would not be on display in markets.

The impact of varying amounts of clove powder on the physicochemical, nutritional, bioactive, and sensory qualities of cookies was examined in the research by (16). The addition of clove powder to cookie recipes at concentrations less than 2.0% enhanced the cookie flour's pasting qualities, texture, and ability to hold onto water and oil. Moreover, clove powder improved cookies' nutritional, physical, textural, and bioactive qualities without detracting from their sensory qualities.

Overall, adding clove powder to cookie recipes can improve the cookies' nutritional value and overall health, consistent with recent research findings. Fish from breeding waters tend to have lower water contents and greater fat contents, whereas fish from open waters often have higher water contents. The fresh flesh of the little carp had the highest protein level (20.92%), whereas the meat of the bleak had the lowest protein content (17.01%).

The meat of the little carp had the highest fat content (11.53%), which is a result of both hereditary traits and rigorous feeding in fisheries settings. The bleak fresh beef sample had the lowest fat percentage, measuring in at 3.64%. The schneider meat has the highest ash percentage (1.96%), while the little carp flesh has the lowest amount (0.82%). Because they live in environments with greater concentrations of limestone and other minerals, fish from open waterways have higher ash contents (24).

The findings of Naz et al.'s statistical test (25) indicate that there are no significant ($P > 0.05$) variations in the moisture and ash content among the chosen farm species. In the ANOVA and LSD statistical tests, different species of rivers showed that the moisture content was highest in grass carp and lowest in silver carp, while ash and crude fat were highest in silver and lowest in grass carp. The highest amount of crude protein was found in rohu and the lowest in grass carp. Grass carp had the lowest crude protein content, whereas rohu had the highest. Following a comparison of the two types, it was found that the farmed rohu had higher protein, fat, and ash contents, while the wild rohu had a higher moisture content. There was no significant ($P > 0.05$) difference in the moisture content of the farm and river. The protein and fat content of the farmed mori were higher than that of the wild mori. The conclusion was that farmed fish had superior nutrition compared to wild fish.

The evaluation of wild and farmed fish sources may differ due to their respective feeding patterns and the high percentage of proximate composition in farmed fish (26). It was reported that farmed fish are less firm than wild fish; this is possibly attributed to a higher fat content in farmed fish (27). Consumers are increasingly seeking natural, safer food options without synthetic preservatives, while also desiring extended shelf life for food products. Essential oils (EOs) are employed in the food industry to improve flavor and preserve foods due to their antimicrobial and antioxidant properties, which reduce the need for synthetic preservatives and extend shelf life. Thyme and clove EOs, known for their antimicrobial and antioxidant effects, have been successful in controlling oxidation

reactions and preserving meat. Furthermore, consumers appreciate these flavors, which they are already familiar with (28), so the results of this study may contribute to improving food quality hygiene. (18) concluded that incorporating grape pomace into carp diets had varied effects on growth performance, physiological parameters, and biochemical composition. While most growth parameters remained unaffected, significant differences were observed in the hepatosomatic index, indicating a notable impact on liver size relative to body weight. The biochemical composition of carp meat was also altered, with differences in the moisture, protein, fat, collagen, and salt content between the control and experimental groups being noted. Also, adding grape pomace seemed like it could change microbial and oxidative stress levels, which suggests that it might play a part in improving antioxidant defenses and changing the microbiota in the gut. These findings underscore the importance of grape pomace as a sustainable feed ingredient in aquaculture, offering insights into its potential benefits for fish health and nutrition. Further research is warranted to elucidate the underlying mechanisms and optimize the inclusion levels of grape pomace in fish diets for maximizing its nutritional and health-promoting effects.

Conflicts of interest

The authors declare that there is no conflict of interest.

Ethical Clearance

This work is approved by The Research Ethical Committee.

References

1- Maghfira L L, Stündl L, Fehér M, Asmediana A (2023). Review on the fatty acid profile and free fatty acid of common carp (*Cyprinus carpio*). *Acta Agraria Debreceniensis, 2*. DOI: 10.34101/ACTAAGRAR/2/13290.

2-Gai X, Wang H, Liu J, Zhai L, Liu S (2014). Effects of Feedstock and Pyrolysis Temperature on Biochar Adsorption of Ammonium and Nitrate. *PLoS ONE, 9*(12), e113888. doi:10. 1371/journal.pone.0113888.

3-Nader PJ (2017). Impact Of Black Grape By-Products on Some Growth Performance, Blood, Biological Parameters, And Chemical Composition in Common Carp (*Cyprinus carpio* L.). Master Thesis. College Of Agriculture, Kirkuk University. 71pp.

4-Hassan BR (2016). Impact Of Clove and Mustard As Anesthetics On Small Common Carp (*Cyprinus carpio* L.). Master thesis. Faculty of Agricultural Sciences, University of Sulaimani: 102pp.

5-Dolatowski Z, and Stasiak DM **(2002).** Czystosc mikrobiologiczna miesa i szynki parzonej poobróbce ultradzwiekowej Bacterial Contamination of Meat and Meat Products after Ultrasound Treatment. *Acta Scientiarum Polonorum Technologia Alimentaria*, *1*, 55-65.

6-Tarladgis B, Watts BM, Yonathan M, Dugan LJ (**1960**). Distillation method for determination of malonaldehyde in rancidity food. *Journal of the American Oil Chemists' Society, 37*(1), 44-48.

7-Günşen U, Özcan A, Aydın A (2011). Determination of Some Quality Criteria of Cold Storaged Marinated Anchovy under Vacuum and Modified Atmosphere Conditions. Turkish *Journal of Fisheries and Aquatic Sciences, 11*, 233-242.

8-Gamal El-Deen, El-Shamery MR (2010). Studies on contamination and quality of fresh fish meats during storage. *Egypt. Acad. J. biolog. Sci, 2*(2), 65- 74.

9-Buyukcapar, H.M. and Kamalak, A. (**2007**). Partial replacement of fish and soya bean meal protein in mirror carp (*Cyprinus carpio*) diets by protein in hazelnut meal. *South African Journal of Animal Science, 37* (1): 35-44.

10-Aljobair MO (2022). Physicochemical, nutritional, and sensory quality and storage stability of cookies: effect of clove powder, *International Journal of Food Properties, 25*, 1, 1009-1020, DOI: 10.1080/10942912.

11-Abdulrahman NM (2016). Impact of grape seed as food supplement on growth Performance, organoleptic evaluation, and proximate Analysis of common carp. *Basrah Journal of Veterinary Research, 15*(3), 183-191.

12-Parisi G, Mecatti M, Lupi P, Zampacavallo G, Poli BM (**2001**). Fish welfare and quality: experimental results on rearing and harvesting practices. In: Proceedings of the Third Congress of the European Society for Agricultural and Food Ethics (EURSAFE 2001) Food Safety, Food Quality and Food Ethics, pp. 337–340.

13- Kurćubić V, Marković G, Mašković P, Miletić N, Vučićević D. (2017). Basic parameters of the quality of fresh meat of different types of freshwater fish. *Acta Agriculturae Serbica, XXII, 43*, 47-551.

14-Naz S, Nawab K, Bano N, Rafique S, Ali U, Khubaib M, Ali U, Ismaila A, Rehman N, Tariq A. Ali M (2020). Comparative Study of Proximate Parameters of both Farmed and Wild Selected Fish Species. *Adv. Biores., 11* (5), 21-29. DOI: 10.15515/abr.0976-4585.11.5.2129

15- Jankowska B, Zakęs Z, Żmijewski T, Szczepkowski M (2003). A comparison of selected quality features of the tissue and slaughter yield of wild and cultivated pikeperch *Sander lucioperca* (L.). *Eur. Food. Res. Technol, 217*, 401- 405.

16-Lie Ø (2001). Flesh quality- the role of nutrition. *Aquacult. Res, 32*, 341-348.

17-Ricardo-Rodrigues S, Rouxinol MI, Agulheiro-Santos AC, Potes ME, Laranjo M, Elias M (2024). The Antioxidant and Antibacterial Potential of Thyme and Clove Essential Oils for Meat Preservation—*An Overview. Appl. Biosci, 3*, 87–10.

18-Barbacariu CA, Dîrvariu L, Serban DA, Rîmbu CM, Horhogea CE, Dumitru G, Todiras cu-Ciornea E, Lungoci C, Burducea M. (2024). Evaluating the Use of Grape Pomace in Cyprinus carpio Nutrition: Effects on Growth, Biochemistry, Meat Quality, Microbiota, and Oxidative Status. *Fishes, 9*, 219. https://doi.org/10.3390/fishes9060219

دراسة مقارنة لمسحوق البرسيم والقرنفل كمضاد أكسدة طبيعي على بعض الخصائص الجودة اللحوم في الكارب الشائع (*Cyprinus carpio* L)

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الخلاصة

تم شراء مسحوق القرنفل المجفف (*Eugenia caryophyllata*) من سوق تقليدي محلي، في حين تم الحصول على البرسيم (*Medicago sativa*) من زراعة طبيعية. تم الحصول على المستخلص المائي لكل من مسحوق القرنفل والبرسيم باستخدام جهاز سوكسليت، ثم تم تجميد الاستخراجات (المستخلصات) . تم استخدام هذه الاستخراجات(المستخلصات) كمضادات أكسدة طبيعية. تم شراء أسماك الكارب الشائعة (*Cyprinus carpio* L.) من سوق محلي ونقلها على قيد الحياة إلى المختبر. بعد تبريدها لمدة 24 ساعة، تم إزالة (استخراج) شرائح السمك من الثلاجة وتقطيعها إلى قطع متجانسة (3 × 3 × 3 سم). تم تعيين هذه القطع عشوائيًا لأربعة علاجات لكل إضافة. تم غمر عينات السمك في 100 مل من محلول مضاد للأكسدة بتركيزات 0% (الضابط)، 0.5%، 1%، 1.5%، و 2% من استخراج (مستخلص) القرنفل، البرسيم الإيراني، ومحاليل البرسيم المحلي، على التوالي، وتركها عند درجة حرارة الغرفة لمدة ساعة واحدة. أظهرت المعاملة الضابطة (1T) بدون أي مكملات مستويات أعلى بشكل ملحوظ من أكسدة الدهون والرقم الهيدروجيني مقارنة بالمعاملات الأخرى. أثرت إضافة 2% من القرنفل بشكل ملحوظ على نسبة الرطوبة، حيث أظهرت أقل قيمة، مع زيادة ملحوظة في قدرة الاحتفاظ بالماء. كانت نسبة فقدان الطهي أعلى بشكل ملحوظ في المعاملات الضابطة والبرسيم الإيراني مقارنة بالمعاملات الأخرى. أظهرت المعاملة الضابطة أيضًا مستويات أعلى بشكل ملحوظ من الذينين (Mb) ونسبة الميثيل الذينين (Met-Mb) مقارنة بالمعاملات الأخرى. لم تكن هناك فروقات ملحوظة ($p<0.01$) فيما يتعلق بالنكهة، والنعومة، والقبول العام. كان البرسيم الإيراني والمعاملة الضابطة أعلى بشكل ملحوظ ($p<0.01$) في لون لحم السمك.

الكلمات المفتاحية: البرسيم، القرنفل المجفف، صفات لحم الاسماك، الكارب العادى.