

(*Osphronemus goramy*)

(*Cyprinus carpio*)

(*Oncorhynchus mykiss*)

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(// : // :)

ECI¹ (L*)

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(/ ± /)

(/ ± / / ± /)

(*Osphronemus goramy*) :

¹ Entire color index

² chewiness

³ gumminess

...

(Zmijewski *et al.*, 2006)

(Kujawa *et al.*, 1998;
Mamcarz *et al.*, 2001; Witkowski, 1996)
(Garcia, 1998;
Kinsella, 1986; Brown, 1986; Zmijewski, 2006)
(*Osphronemus goramy*
(Lacepede, 1801))

(:
(CIE, 1978)
(L*)
(a*-b*)
ECI
(Sandford, 2000)
()
(Ebrahimi *et al.*, 2009)
(Pavlidis, 2006)
(Faridpaak, 1986)
(Emaadi, 1981)
(Hyldig and
(Nielsen, 2001)
(Faridpaak, 1986)
(Ebrahimi *et al.*, 2010)
(Szczesniak, 1963)

² hardness
³ springiness
⁴ juiciness

¹ Giant gourami

(Brandt *et al.*, 1963)

(Gines *et al.*, 2004; Schubring, 2006)

/ ± /

± /

(Abbasi, 2007)

- ()

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/ ± /

/ ± /

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pH EC

Takur

2009 Zolfaghari

2007

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(± /

± /

/ × / × /

¹ cohesiveness
² adhesiveness

...

()

(Whirlpool, Brazil)

()

(Esmailzade kenari *et al.*,

() () ECI

2003)

:(Pavlidis *et al.*, 2006)

:

(1) Chroma= (a²+ b²)^{0/5}

(2) H° = arctan (b*/a*)

() ()

(3) ECI_i= C_i* cos (H_i-H_{mean})

H_i C_i H_{mean}

LFRA Texture

(AOAC, 2005)

(Brookfield LFRA 4500 analyzer

(James, 1995)

engineering laboratories, USA)

SE 416 Soxtec

/ TPA³

Gerhardt

(James, 1995)

Gerhardt vap 40 kjeldtherm

/

/

(AOAC, 2005)

:

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(

Colour and Appearance

Measurement System.

(Camera system CAM- System 500)

L* [CIE]

+ b* a*

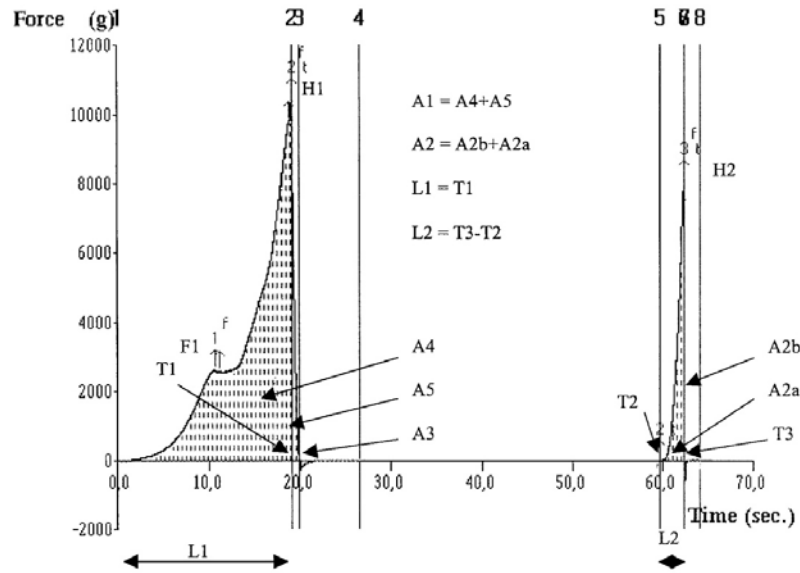
+

¹ Chroma

² Hue

³ Texture Profile Analysis

+



$$A1 = A4 + A5$$

$$A2 = A2b + A2a$$

$$L1 = T1$$

$$L2 = T3 - T2$$

$$= \frac{(L2/L1) (Time3 - Time2)/Time1 = \text{force2, H1} = \dots}{(Gines et al., 2004) (A3) = [H1 * (A1/A2) * L2/L1] = [H1 * (A1/A2)] = (A1/A2)}$$

SAS Excell
Oriana version 3.00

± / ;pH / ± / :EC : ()
± / : / ± / : / (Zar, 1996; Pavlidis *et al.*, 2006)
/

ECI

()

¹ Rayleigh
² Watson-Williams

...

()	()	()	()	()
/	/	/	/	/
/	/	/	/	/

() ±

/	/ ± / ^c	/ ± / ^b	/ ± / ^a	()
/	/ ± / ^c	/ ± / ^b	/ ± / ^a	()
/	/ ± / ^b	/ ± / ^b	/ ± / ^a	()
/	/ ± / ^c	/ ± / ^b	/ ± / ^a	()

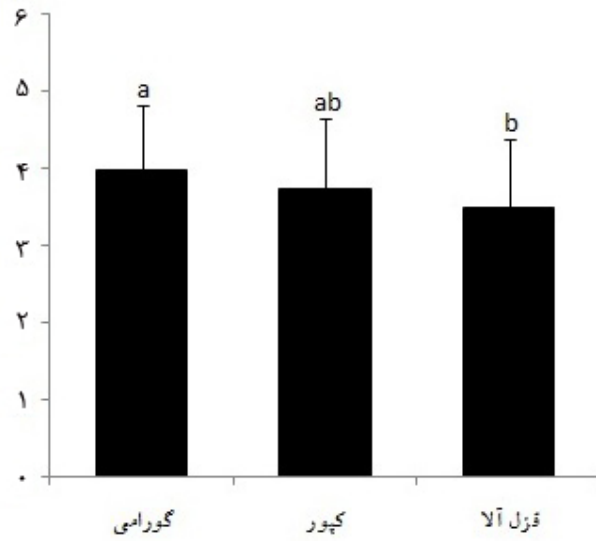
(p < /)

()

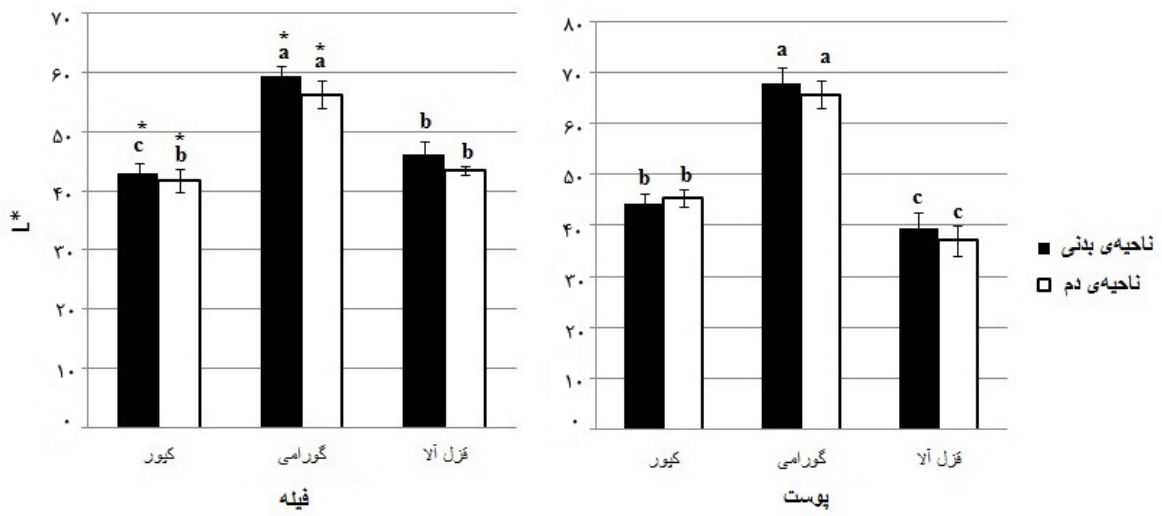
(() ()) ±

/ ± / ^{ab}	/ ± / ^b	/ ± / ^a
/ ± / ^b	/ ± / ^a	/ ± / ^a
/ ± / ^a	/ ± / ^a	/ ± / ^a

(p < /)



(p < /)



()

(p < /)

ECI

()

...

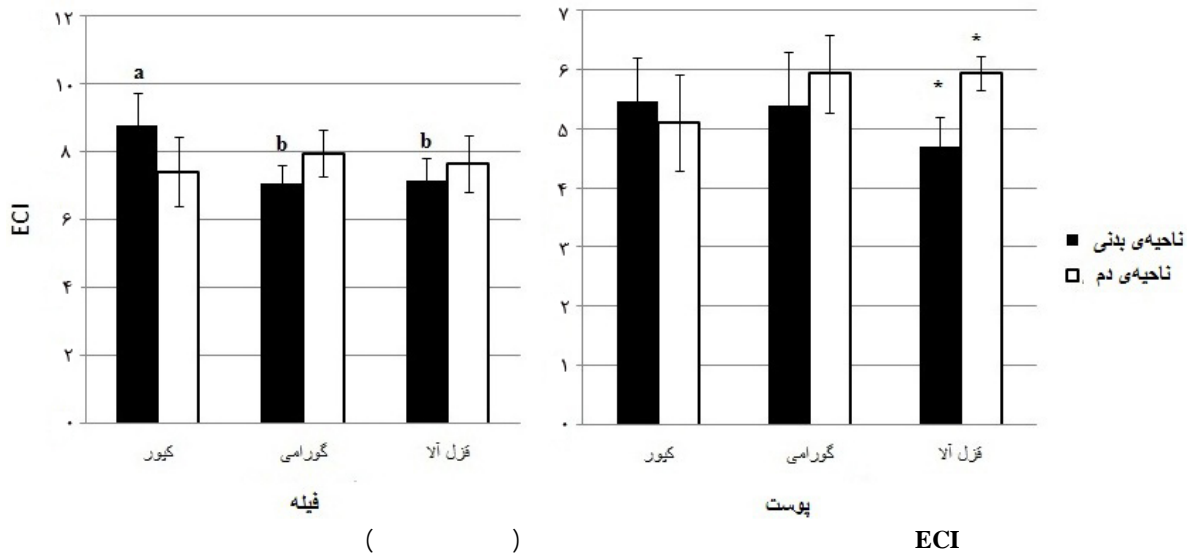
ECI

()

	$ \pm \rangle$
$\rangle $	$ \pm \rangle$
$ \rangle \mathbf{P} \rangle $	$ \pm \rangle$
	$ \pm \rangle$
$\rangle $	$ \pm \rangle$
	$ \pm \rangle$

$ $	$ \pm \rangle$
a	$ \pm \rangle$
$ $	$ \pm \rangle$
b	$ \pm \rangle$
$ $	$ \pm \rangle$
a	$ \pm \rangle$

($p < |$)



(p < /)

/	a	/ ± /	b	/ ± /	c	/ ± /	
/	b	/ ± /	a	/ ± /	b	/ ± /	(Nmm)
/		/ ± /	/	± /	/	± /	(Ns)
/	b	/ ± /	a	/ ± /	b	/ ± /	(N)
/	b	/ ± /	a	/ ± /	b	/ ± /	(N)
/	a	/ ± /	b	/ ± /	b	/ ± /	(mm)

(p < /)

(Ronsholdt and Mclean, 2004; Torrissen *et al.*, 2001; Rasmussen *et al.*, 2000)

(Barton-Gade *et al.*, 1988)

¹ juiciness
² flavor

...

/ / /)

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Kolakowska and Kolakowski, Shearer, 1994
Jankowska *et al.*, Zmijewski *et al.*, 2006 2000
2007

Venugopal, 2006

Wimalasena and

Jayasuriya

/ *Anabas testudineus*

Jobling .

Jankowska *et al.*, 2007

(Wimalasena and Jayasuriya, 1996)

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	()	()	()	()
Zolfaghari, 2009	/ ± /	/ ± /	/ ± /	/ ± /
	/ ± /	/ ± /	/ ± /	/ ± /
Takur, 2007	/ ± /	/ ± /	/ ± /	/ ± /

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ECI

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ECI

ECI

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ECI

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Pavlidis *et al.*, 2006 .()

Sparidae

Jankowska *et al.*, 2007

ECI

ECI

ECI

-

Lin *et al.*, 2009

()

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TPA¹

(

.(Veland and Torrissen, 1999)

TPA

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(Gines *et al.*,

.(Huidobro *et al.*, 2005)

2004)

(Fauconneau *et al.*, 1995)

(Chambers and

.Bowers, 1993)

(Andersen *et*

al., 1997)

Lin *et al.*, 2009

(Dunajski,

1079; Haard, 1992)

¹ the Texture Profile Analysis

(Hatae *et al.*, 1990; Johnston, 1999)

References

- Abbasi, S., 2007. Food reology, texture and viscosity: Concept and Measurement translation from Food texture and viscosity: Concept and Measurement, 2nd ed, c2002, auther: Born, M., Marze danesh publication, 384pp.
- Ambak, M.A., Jalal, K.C.A., 2006. Sustainability issues of reservoir fisheries in Malaysia. Aquatic ecosystem health and management 9, 165-173.
- Andersen, U.B., Thomassen, M.S., Røra, A.M.B., 1997. Texture properties of farmed rainbow trout (*Oncorhynchus mykiss*): effects of diet, muscle fat content and time of storage on ice. Journal of the Science of Food and Agriculture 74, 347–353.
- AOAC, 2005. Official method of analysis of AOAC international. (18th Ed.) AOAC international, Virginia, USA.
- Barton-Gade, P.A., Cross, H.R., Jones, J.M., Winger, R.J., 1988. In H.R. Cross & A.J. Overby (Eds.), Meat science, milk science and technology. Elsevier Science Publishers B.V., Amsterdam, 141–171.
- Brandt, M.A., Skinner, E.Z., Coleman, J.A., 1963. Texture profile method. Journal of Food Science 29, 404–409.
- Brown, W.D., 1986. Fish muscle as food. In: Bechtel, P.J. (Ed.), Muscle as Food. Academic Press INC, Orlando: 406–445.
- Chambers, E.N., Bowers, J.R., 1993. Consumer perception of sensory quality in muscle foods. Food Technology 47(11), 116–120.
- CIE (Commission Internationale de l' Eclairage), 1978. Recommendations on uniform color spaces, color difference equations, psychometric color terms. Supplement No 2 to CIE Publication No 15, Colorimetry, Bureau Central de la CIE, Paris.
- Dunajski, E., 1979. Texture of fish muscle. Journal of Texture Studies 10, 301–318.
- Ebrahimi, M.H., Imanpour, M.R., Adlo, M.N., 2009. Effects of temperature on survival and growth factors of Giant gourami (*Osphronemus goramy* (Lacepede, 1801)). Iranian Congress of Modern aquaculture and sustainable development, 966-971.
- Ebrahimi, M.H., Imanpour, M.R., Adlo, M.N., 2010. Effects of stocking density on growth factors, survival and blood and tissue parameters, in Giant gourami (*Osphronemus goramy* (Lacepede, 1801)). Azad shahr journal of fisheries 4(2), 97-106.
- Emaadi, H., 1981. The aquarium for freshwater fishes. Technical institute of fish culture, Tehran, 294 pp.
- Esmailzade kenari, R., Sahari, M.A., Hamidi esfahani, Z., 2003. Comparing the nutritional composition of Mahi sefid fish (*Rutilus frisii kutum*) and Grass carp (*Ctenopharyngodon idella*) and processing them to the Marynad. Iranian Journal of fisheries 4, 13-28.
- Faridpaak, F., 1986. Artificial reproduction and rearing of warmwater fishes. Ministry of Jahad keshavarzi, 370 pp.
- Fauconneau, B., Alami-Durante, H., Laroche, M., Marcel, J., Vallot, D., 1995. Growth and meat quality relations in carp. Aquaculture 129, 265–297.

- ...
-
- Garcia, D.J., 1998. Omega-3 long-chain PUFA nutraceuticals. *Food Technology* 52, 44–49.
 - Gines, R., Valdimarsdottir, T., Sveinsdottir, K., Thorarensen, H., 2004. Effects of rearing temperature and strain on sensory characteristics, texture, colour and fat of Arctic charr (*Salvelinus alpinus*). *Food Quality and Preference* 15, 177–185.
 - Haard, N.F., 1992. Control of chemical composition and food quality attributes of cultured fish. *Food Research International* 25, 289–307.
 - Hatae, K., Yoshimatsu, F., Matsumoto, J.J., 1990. Role of muscle fibers in contributing firmness of cooked fish. *Journal of Food Science* 55(3), 693–696.
 - Huidobro, F.R., Miguel, E., Blazquez, B., Onega, E., 2005. A comparison between two methods (Warner–Bratzler and texture profile analysis) for testing either raw meat or cooked meat. *Meat Science* 69, 527–536.
 - Hyldig, G., Nielsen, D., 2001. A review of sensory and instrumental methods used to evaluate the texture of fish muscle. *Journal of Texture Studies* 32, 219–242.
 - James, C.S., 1995. Analytical chemistry of foods. Blackie academic and Professional press, 90–92.
 - Jankowska, B., Zakes, Z., Zmijewski, T., Szczepkowski, M., Kowalska, A., 2007. Slaughter yield, proximate composition, and flesh colour of cultivated and wild perch (*Perca fluviatilis* L.). *Czech Journal of animal science* 52(8), 260–267.
 - Jobling, M., 2001. Nutrient partitioning and the influence of feed composition on body composition. In: Houlihan D., Boujard T., Jobling M. (eds.): *Food Intake in Fish*. Blackwell Science Ltd., Oxford, UK, 354–375.
 - Johnston, I.A., 1999. Muscle development and growth: potential implications for flesh quality in fish. *Aquaculture* 177, 99–115.
 - Kinsella, J.E., 1986. Food components with potential therapeutic benefits: the n-3 polyunsaturated fatty acids of fish oils. *Food Technology* 40, 89–97.
 - Kolakowska, A., Kolakowski, E., 2000. XXXI Scientific Session of the Committee for Food Technology and Chemistry. PAN, Poznań, 14–15.
 - Kujawa, R., Mamcarz, A., Kucharczyk, A., 1998. Biotechnology of reproduction and breeding of asp (*Aspius aspius* L.). *Czech Journal of Animal Science* 43, 396–401.
 - Lin, W.L., Zeng, Q.X., Zhu, Z.W., 2009. Different changes in mastication between crisp grass carp (*Ctenopharyngodon idellus* C.et V) and grass carp (*Ctenopharyngodon idellus*) after heating: The relationship between texture and ultrastructure in muscle tissue. *Food Research International* 42, 271–278.
 - Mamcarz, A., Kujawa, R., Furga" a-Selezniow, G., Kucharczyk, D., 2001. Preliminary results of larval and asp (*Aspius aspius* L.) rearing in the illuminated cages. *European Aquaculture Society, Special Publication* 30, 328–331.
 - Pavlidis, M., Papandroulakis, N., Divanach, P., 2006. A method for the comparison of chromaticity parameters in fish skin: preliminary results for coloration pattern of red skin Sparidae. *Aquaculture* 258, 211–219.
 - Rahimi, M., Ebrahimi, M.H., 2007. Culture and breeding of Giant gourami. *Abziparvar* 15(23), 34–37.
 - Rasmussen, R.S., Ostenfeld, T.H., Rønsholdt, B., McLean, E., 2000. Manipulation of end product quality in rainbow trout with finishing feeds. *Aquaculture Nutrition* 6, 17–23.
 - Rønsholdt, B., McLean, E., 2004. Effect of growth hormone and salbutamol on growth performance, fillet proximate composition and pigmentation of rainbow trout (*Oncorhynchus mykiss*). *Aquaculture* 229, 225–238.
 - Ruber, L., Britz, R., Zardoya, R., 2006. Molecular phylogenetics and evolutionary diversification of labyrinth fishes (Perciformes: Anabantoidei). *Systematic Biology* 55, 374–397.
 - Ruiz de Huidobro, F., Can˜eque, V., Lauzurica, S., Velasco, S., Pe´rez, C., Onega, E., 2001. Sensory characterization of meat texture in sucking lambs. *Methodology. Investigacio´ n Agraria: Produccio´ n y Sanidad Animales* 16(2), 223–234.
 - Sandford, G., 2000. An illustrated encyclopedia of Aquarium fish. Greenwich edition, Printed in Singapore by starstandard industries, P34.
 - Schubring, R., 2006. Thermal stability, texture, liquid holding capacity and colour of smoked salmon on retail level. *Thermochimica Acta* 445, 168–178.
 - Shearer, K.D., 1994. Factors affecting the proximate composition of cultured fish with emphasis on salmonids. *Aquaculture* 119, 63–88.
 - Szczesniak, A., 1963. Classification of textural characteristics. *Journal of Food Science* 29, 385–389.

-
- Takur, B., 2007. The effect of different cooking methods on proximate composition and lipid quality of rainbow trout (*Oncorhynchus mykiss*). *International Journal of Food Science and Technology* 42, 874-879.
- Torrissen, O.J., Sigurgisladottir, S., Slinde, E., 2001. Texture and technological properties of fish. In: Kestin, S.C., Warriss, P.D. (Eds.), *Farmed Fish Quality*. Blackwell Science, London, Fishing News Books, 42-57.
- Veland, J.O., Torrissen, O.J., 1999. The texture of Atlantic salmon (*Salmo salar*) muscle as measured instrumentally using TPA and Warner-Bratzler shear test. *Journal of Animal Science in Food and Agriculture* 79, 1737-1746.
- Venugopal, V., 2006. *Sea food processing, Adding value through quick freezing, retortable packaging cook- chilling*. Taylor Francis Group Press, 485 pp.
- Wimalasena, S., Jayasuriya, M.N.S., 1996. Nutrient analysis of some fresh water fish. *Journal of the National Science Council of Sri Lanka* 24(1), 21-26.
- Witkowski, A., 1996. Introduced fish species in Poland: pros and cons. *Archives of Polish Fisheries* 4, 101-112.
- Zar, J.H., 1996. *Circular Distributions, Biostatistical Analysis*, 3rd edition. Prentice-Hall International, INC, 591-652.
- Zmijewski, T., Kujawa, R., Jankowska, B., Kwiatkowska, A., Mamcarz, A., 2006. Slaughter yield, proximate and fatty acid composition and sensory properties of rapfen (*Aspius aspius* L) with tissue of bream (*Abramis brama* L) and pike (*Esox lucius* L). *Journal of food composition and analysis* 19, 176-181.
- Zolfaghari, M., 2009. The relationship between size of marine and cultural carp with chemical composition and fillet yield and compare them. Msc thesis. Fisheries group. Gorgan University of Agricultural Sciences and Natural Resources. 119 pp.

Comparison between chemical composition and sensory evaluation parameters of Giant gourami (*Osphronemus goramy*), Rainbow trout (*Oncorhynchus mykiss*) and Common carp (*Cyprinus carpio*)

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Abstract

In this study, proximate composition and sensory evaluation of Giant gourami compared with Rainbow trout and Common carp. Brightness (L^*) was significantly higher than the other species and this leads to the highest score in sensory evaluation of the fillet color. Moreover ECI index of carp was significantly higher than that of the other two fish, in body part. Between the species, hardness, chewiness and gumminess of the gourami was significantly higher. Lipid and ash values were the highest (6.29 ± 0.16 and 1.6 ± 0.39 percent of flesh) and protein was the lowest (16.53 ± 0.18) in the gourami. Also color, flavor and total acceptance of the gourami fillet obtained significantly higher scores than two others. Finally in respect of the results obtained, flesh properties of the gourami are compatible with other two fish.

Keywords: Giant gourami (*Osphronemus goramy*), chemical composition, sensory evaluation