Physical, Chemical, and Functional Characteristic of 'Wader'(*Rasbora jacobsoni*), 'Bader'(*Puintius javanicus*), and 'Patin'(*Pangasius hypophthalmus*) Fillet

Yuli Witono[1*], Yuli Wibowo[1,],WiwikSiti Windrati[1], Iwan Taruna[2],
Lailatul Azkiyah[1]danIsnairil Akbariwati[1]

[1]Dept. Agricultural Product Technology - Faculty of Agricultural Technology- The University of Jember
Jl. Kalimantan I Jember, East Java 68121, Indonesia
[2]Dept.Agricultural Engineering - Faculty of Agricultural Technology- The University of Jember
Jl. Kalimantan I Jember, East Java 68121, Indonesia
*Correspondence Author, e-mail: yuliwitono.ftp@unej.ac.id

ABSTRACT

Common water fish are abundant in Indonesia, but has low economic value due to its strong smell and softening of its flesh as well as 'wader' (*Rasbora jacobsoni*), 'bader' (*Puintius javanicus*), and 'patin' (*Pangasius hypophthalmus*). This study describes the variability of important quality of this fish including physical, chemical and functional properties as the basic knowledge for further exploration primarily as an industrial raw material of food ingredient. The result showed that wader, bader, and patin fillet have high yield (64.71; 45.26; and 57.97% respectively), high content of protein (12.56; 15.08; and 11,38% respectively) and high emulsifying activity index (2.42; 2.37; and 2.98 m^2/g respectively). Total amino Acids were identified by HPLC of all the study fishes. Patin contained the highest percentage 19.06%, followed by wader 17.09%, and bader revealed having the least content 11.54%. It is indicated that this fish was suitable to be applied on food product and high nutritive value of water fish products.

Keywords: wader, bader, patin, physical, chemical, and functional

I. INTRODUCTION

Approximately 15% of the total dietary intake of animal protein for all people in the world comes from fish, withworld per capita fish consumption almost doubled from an average of 9.9 kg in the 1960s to 18.4 kg in 2009 (FAO, 2012). With the growth of consumption,customers have developed higher standards for the quality of products. Therefore, strongerattention to procedures for maintaining freshness and quality of the fish is needed on behalf of processors (Valtysdottir *et al*., 2010).

Fish has several important nutritional higher than other meat types, that is low in cholesterol and high in good quality protein (Terry *et al*., 2001). They are practically the sole source of long chain polyunsaturated fatty acids such as those of the Omega-3 series, which decreased risk of prostate cancer (Jabeen and Chaudhry, 2011).

‘Wader’ (*Rasbora jacobsoni*), ‘bader’ (*Puintius javanicus*), and ‘patin’ (*Pangasius hypophthalmus*) are found in freshwater fish that abundant in Indonesia. The fish still have a low economic value because have strong smell and softening of its flesh.The aim of the research was to characterises the physical, chemical, and functional properties those fish to provides the elements for decisions on the follow-up of industrial processes or research in the future.

II. MATERIAL AND METHODS

2.1 Material

‘Wader’ (*Rasbora jacobsoni*), ‘bader’ (*Puintius javanicus*), and ‘patin’ (*Pangasius hypophthalmus*)was purchased from Tanjung Market, a local market of Jember district, Indonesia. Amino acid standards were purchased from Pierce (Rockford, IL, USA) and other chemical of analytical grade were purchased from Sigma (Sigma – Aldrich).

2.2 Preparation of fillets

A weight of 500 g of wader, bader, and patin were obtained from the local fish market in Jember, Indonesia. They were kept in a plastic container and transported to the laboratory. Upon arrival at the laboratory, the fish were washed with tap water several times to remove adhering blood and excessive mucus. The fish were then placed in ice-cold water (hypothermia) for five minutes prior to eviscerating and beheading. Subsequently the fish samples were filleted and fillets were weighed .

2.3Chemical and functional properties

Crude protein content was determined using Kjedahl method (AOAC, 2005). Moisture content wasdetermined with a modified version of the AOAC (AOAC, 2005).Fat content was determined by using Soxhlet extractor(Behrotest, Behr Labor Technik Gro bH, Dusseldorf,Germany). The dried sample was inserted into a Soxhlet tubeand petroleum ether was recycled though the sample for 2 hr.Remaining ether was evaporated and the sample was dried at 105°C overnight. Fat content was then calculated gravimetrically. The ash content was analyzed using a modified version of AOAC (AOAC, 2005). Determination of the emulsion stability (ES) based on the method of Chobert *et al.* (1988) with modification. Determination of emulsifying activity index (EAI) based on the method of Pearce and Kinsella (1978).Amino acid analysis of samples was based on methodology previously reported by Vázquez-Ortiz *et al.* (1995). A gradient mobile phase of sodium acetate 0.1 M pH

7.2 and methanol (9:1) elute sample for amino acid separation trough C18 column reversed-phase octadecyl dymethylsilane particles (100 x 4.6 mm x 1/4" Microsorb 100-3 C18). Fluorescence detection was realized using an excitation-emission wavelength of 360 and 455 nm respectively.

2.5Statistical Analysis

All the data have been showed as average value ± standar deviation.

III. RESULTS AND DISCUSSION

a. Fillet yield

Average fillet weight of wader, bader, and patin were 64.71; 45.26; and 57.97% respectively (**Fig. 1**). Fillet yields depend on several factors, such as size, age, sex, anatomic shape of the body, head size and weight of viscera, skin and fins. The efficiency of the fillet machine and the expertise in handling are aspects that should be taken into account (De Souza *et al.*, 2015). Moreover, yields in farmed fish may also be influenced by culture conditions such as feed, water temperature and breeding structures (Borderías and Sánchez-Alonso, 2011).

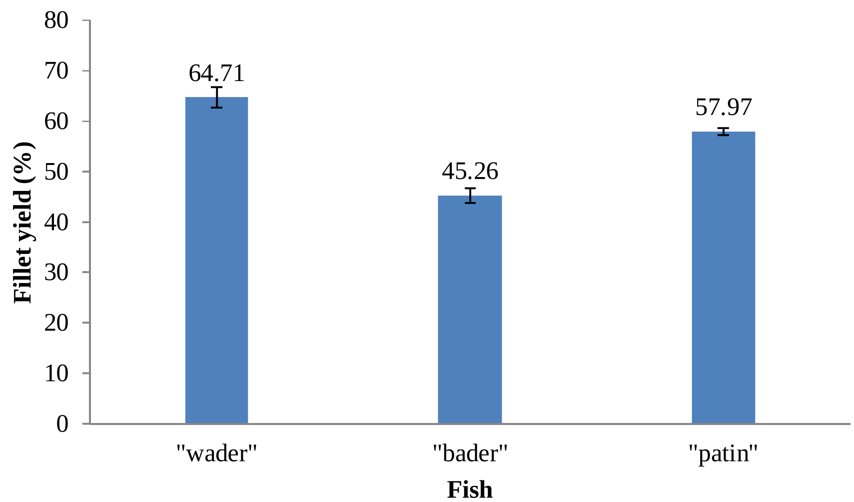

Figure 1. The fillet yields of wader, bader, and patin

Further, information on the processing yield may be of great help for fish quality control and for thetracing system, with an increase in profits in the processing chain (Galvão *et al.*, 2010).

b. Chemical composition

The chemical composition of fishfillets are presented in Table 1. The highest protein content was recorded in bader(15.08 %) followed by wader(12.56%), and the lowest was patin (11.38%).

Table 1.Proximatecomposition of wader, bader, and patin fillets

Parameter		**(% w/w)**	
	"wader"	**"bader"**	**"patin"**
Protein	12.56 ± 0.54	15.08 ± 1.35	11.38 ± 0.40
Fat	9.10 ± 0,16	7.60 ± 0.69	18.30 ± 0.76
Ash	0.85 ± 0.14	0.96 ± 0.12	1.02 ± 0.24

Fish are normally classified according to their fatty contents, or rather, lean fish (fat rate less than 5%); moderately fat fish (fat rate between 5 and 10%) and fat fish (over 10% fat) (Jabeen and Chaudhry, 2011). The wader (9.10%) and bader (7.60%) were classified as moderately fat, and patin was classified as fat fish (18.30%). Variations in the fish's chemical composition are closely related to ration intake since protein rates inthe muscle tissue slightly increase during the feed period and consequently fat rates have a sharp and fast increase (Boran and Karaçam, 2011).

The highest ash content was patin (1.02%) followed by bader (0.96%), and wader (0.85%). According to Rasmussen and Ostenfeld (2000), ash rates of fish range between 0.8 and 1.4%, but may exceed this percentage due to the number of intramuscle fish bones in the fillet. The same author reports that fresh water fish have greater fluctuations, ranging between 0.98 and 3.29%.

The chemical composition of fish meat depends on biotic and abiotic factors related to the species and culture, such as age, season, sex, gonadal development and diet (Burkert *et al.*, 2008) which affected the physical and organoleptic characteristics and shelf life of fish and derivatives (Burkert *et al.*, 2008). Information on fish chemical composition is impotant in the development product based on those fish.

c. Emulsifying activity index (EAI) and emulsion stability (ES)

Proteins are surface active agents that can form and stabilize the emulsion by creating electrostatic repulsion on oil droplet surface (Makri *et al.* 2005). The ability of proteins to form emulsion is important showing to the interactions between proteins and lipids in the food systems. EAI of wader, bade dan patin was 2.42; 2.37; and 2.98 (m^2/g) respectively, while as the ES was0.55; 0.93; and 0.84 (min) respectively.

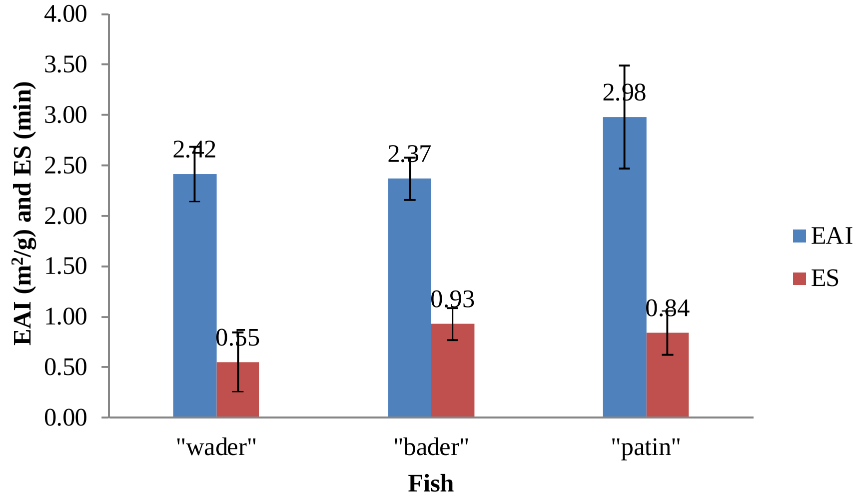

Figure 2. The emulsifying activity index (EAI) (m^2/g) and emulsion stability (ES) (min) of wader, bader, and patin fillet

d. Amino acid composition

Table 2 showed the amino acid composition in wader, bader, and patin fillet. The highest total amino acid was patin (19.06%) followed by wader (17.09%) and bader (11.54%). Glutamic acid was the most rich amino acid in all the fish. According to Chen *et al.* (1996), amino acids such as tyrosine, histidine, lysine, tryptophan and methionine were generally accepted as antioxidants. The result showed that wader, bader, and patin also may be a good source of antioxidant to be incorporated into other products as supplement due to the presence of hydrophobic amino acids.

Table 2. Amino acid composition of wader, bader, and patin fillet

Parameter		**(% w/w)**	
	"wader"	**"bader"**	**"patin"**
Aspartic acid	1.80	1.20	2.13
Glutamic acid	3.15	1.99	3.61
Serine	0.82	0.50	0.89
Histidine	0.39	0.25	0.40
Glycine	0.98	1.26	0.99
Threonine	0.86	0.53	1.02
Arginine	1.19	0.78	1.36
Alanine	1.13	0.96	1.19

Tyrosine	0.62	0.29	0.74
Methionine	0.59	0.32	0.60
Valine	0.81	0.53	0.86
Phenylalanine	0.72	0.48	0.77
l-leucine	0.75	0.45	0.88
Leuicine	1.49	0.93	1.69
Lysine	1.80	1.06	1.91
Amino Acid Total	**17.09**	**11.54**	**19.06**

IV. CONCLUSIONS

The physico, chemical and functional propertiesof wader, bader, and patin provides useful information to great help for fish quality control and for the tracing system, with an increase in profits in the processing chain. Results indicated that, due to the presentation form of the wader, bader, and patin fillet contain of high protein and amino acid and more appropriate to be consumed or developed into another food product. The fish also have high fillet yield and good emulsion properties.

ACKNOWLEDGEMENTS

This Research was funded by Ministry of Research, Technology, and Higher Education, Indonesia through National Strategic Research Grant 2015. The authors also thank to The University of Jember for helping to publish this research.

REFERENCES

AOAC-Association Official Analytical Chemists. (2005). *Official methods of analysis*. (18th ed.). Gaitherburg, Maryland, USA: AOAC.

Boran, G. and Karaçam, H. (2011). Seasonal changes in proximate composition of some fish species from the Black Sea. *Turkish Journal of Fisheries and Aquatic Sciences, 11*(1), 1-5.

Borderías, A. J. and Sánchez-Alonso, I. (2011). First processing steps and the quality of wild and farmedfish. *Journal of Food Science, 76*(1), R1-R5.

Burkert, D., Andrade, D. R. d., Sirol, R. N., Salaro, A. L., Rasguido, J. E. d. A. & Quirino, C. R. (2008). Processing yield and chemical composition of fillets of surubim reared in net cages. *Revista Brasileira deZootecnia, 37*(7), 1137-1143.

Chen HM, Muramoto K, Yamauchi F, Nokihara K. Antioxidant activity of designed peptides based on the antioxidative peptide isolated from digests of a soybean protein. J Agric Food Chem. 1996;44:2619–2623.doi: 10.1021/jf950833m.

Chobert, J.M., C. Bertrand-Hard and M.G. Nicolas, 1988. Solubility and emulsifying properties of caseins andwhey proteins modified enzimatically by trypsin. J. Agri. Food Chem., 36: 883 -892.

De Souza, MLR, Elisabete Maria Macedo-Viegas, Jener Alexandre SampaioZuanon, Maria Regina Barbieri de Carvalho, and Elenice Souza dos Reis Goes (2015). Processing yield and chemical composition of rainbow trout(*Oncorhynchus mykiss*)with regard to body weight. *Maringá*, v. 37, n. 2, p. 103-108.

FAO (2012). Food and Agriculture Organization of the United Nations. The state of world fisheries and aquaculture. FAO statistical yearbook. Rome (Italy).

Galvão, J. A., Margeirsson, S., Garate, C., Viðarsson, J. R. & Oetterer, M. (2010). Traceability system in cod fishing. *Food Control, 21*(10), 1360-1366.

Makri, E., Papalamprou, E. and Doxastakis, G. 2005. Study of functional properties of seed storage proteinsfrom indigenous European legume crops (lupin, peas, broad bean) in admixture within polysaccharides. Food Hydrocolloids 19: 583–594.

Pearce, K. N. and Kinsella, J. E. 1978. Emulsifying Properties of Proteins. Evaluation of a Turbidimetric Technique 26: 716–723.

Rasmussen, R. S. and Ostenfeld, T. H. (2000). Effect of growth rate on quality traits and feed utilisation ofrainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). *Aquaculture*, *184*(3), 327-337.

Terry, P.; Lichtenstein, P.; Feychting, M.; Ahlbom, A. and Wolk, A. (2001). Fatty fish consumption and risk of prostate cancer. Lancet, 357: 1764-66.

Valtysdottir, K. L., Margeirsson, B., Margeirsson, B., Lauzon, H. L., & Martinsdottir, E. (2010). *Guidelines for precooling of fresh fish during processing and choice of packaging withrespect to temperature control in cold chains*. Reykjavik: Matis.

Vázquez-Ortiz FA, Caire G, Higuera-Ciapara I, Hernández G. High performance liquid chromatographic determination of free amino acids in shrimp. *J Liq Chrom 1995; 18: 2059-2068.*