



Original article

Identification compound content of rabbit fishes (*Siganus* sp.) by using GCMS[☆]

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ABSTRACT

Objective: This study aims to identify the content of compounds contained in flesh, skin, and liver in rabbit fishes (*Siganus* sp.).

Methods: The study was conducted in several stages namely: the first stage, sampling of rabbit fishes (*Siganus* sp.); the second step, sample preparation on the flesh, skin, and liver; and the third stage, sample analysis using Pyrolysis Gas Chromatography-Mass Spectroscopy (Py-GCMS) with Shimadzu P2010 type.

Results: Formamide, which is also known as methanamide, is an amide derived from formic acid, found in the flesh of rabbit fishes (*Siganus* sp.) with a concentration of 13.09%, and the skin of rabbit fishes (*Siganus* sp.) with a concentration of 8.34%. In addition, the compound methenamine is found in the skin of rabbit fishes (*Siganus* sp.) with a concentration of 13.71%. While on the skin of rabbit fishes (*Siganus* sp.) also the composition of methyl maltol with a concentration of 14.36%, and 1,4-diaza-2,5-dioxobicyclo[4.3.0]nonane with a concentration of 17.07%. In addition, the liver of rabbit fishes (*Siganus* sp.) contained ammonium carbamate compound with a concentration of 24.77%, dodecanoic acid with a concentration of 5.98%, and ketone with a concentration of 6.48%.

Conclusion: The concentration of compounds in flesh, skin, and liver in rabbitfish (*Siganus* sp.) can be identified using Pyrolysis Gas Chromatography-Mass Spectroscopy (Py-GCMS) where there are a number of useful compounds, but further research is still needed.

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Introduction

The Siganidae, popularly known a rabbit fishes is one of the marine resources abundance in the water of Indonesia. The largest rabbitfish grows to about 53 cm standard length (SL). All have large, dark eyes and small, somewhat rabbit-like mouths, which gives them their name. There are 28 known species in a single genus, *Siganus*.¹

Fish is generally consumed in almost every part of the world, whether which has a way to the water or not, by humans because

it has high protein content, low saturated fat and also contains omega fatty acids known to support good health in very different ways.² Fish and fish oils contain the omega-3 fatty acids known as eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA). Epidemiological studies have shown an inverse relationship between the dietary consumption of fish containing EPA/DHA and mortality from coronary heart disease.³ Many health claims for fish oil (which contains omega-3 fatty acids) in conditions from Alzheimer disease to Zellweger syndrome are based on indirect evidence.⁴

One technique used to analyze the compound content is to use the GCMS method, i.e. determining structure of the compound, and determining residual organic solvents.⁵ The diagnosis of disorders of organic acid metabolism, known as organic acidurias and to be a powerful tool in routine analytical laboratories by increasing sample throughput and improving laboratory efficiency.⁶ Therefore in this study using GCMS to determine the content of compounds found in rabbit fishes (*Siganus* sp.).

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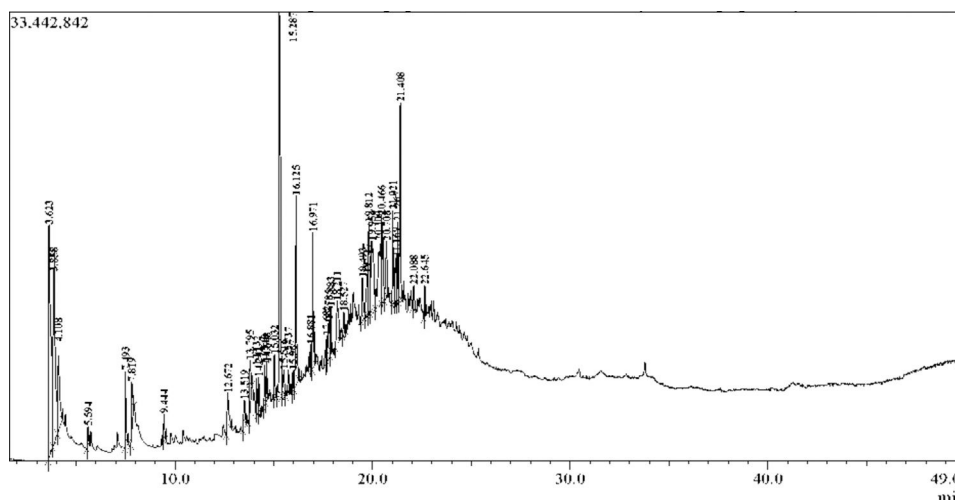


Fig. 1. GCMS chromatogram (TIC) obtained from flesh rabbit fishes (*Siganus* sp.).

Table 1
Three major compounds of the chromatographic fraction of flesh rabbit fishes (*Siganus* sp.) using GCMS analysis.

Peak	R. time	Area	Conc. (%)	Name
1	3.623	142 296 954	13.09	Formamide (CAS) methanamide
2	3.858	98 647 913	9.07	Methanethiol (CAS) mercaptomethane
16	15.287	149 113 915	13.71	1,3,5,7-Tetraazatricyclo[3.3.1.1(3,7)]decane (CAS) methenamine

Method

The study was conducted in several stages, i.e., the first stage, sampling of rabbit fishes (*Siganus* sp.); the second step, sample preparation on the flesh, skin, and liver; and the third stage, sample analysis using Pyrolysis Gas Chromatography-Mass Spectroscopy (Py-GCMS) with Shimadzu P2010 type. At the sample preparation stage, each part of the sample in the form of flesh, skin, and liver is separated. Furthermore, each part is stored in a plastic container that has been given methanol (C₂H₅OH) and then tightly closed and isolated so that it is not easily contaminated. The three sample containers that were prepared were each labeled A, B, and C. Furthermore, the three samples were analyzed for compound content using Py-GCMS.

Research location

The research sample in the form of rabbit fishes (*Siganus* sp.) was obtained from fishermen in the waters of Muna Regency, precisely in Lasunapa Village, Ghai corridor, Duruka District. The samples obtained are cleaned and then taken to the Laboratory for sample preparation and analyzed using Py-GCMS.

Results

Based on the results of the analysis using GCMS, there are compound contents in the flesh of rabbit fishes (*Siganus* sp.) shown in Fig. 1.

Where a number of main compounds with the highest concentrations are shown through several chromatogram peaks as shown in Table 1.

While the results of the analysis using GCMS contained the compound content in skin rabbit fishes (*Siganus* sp.) shown in Fig. 2.

Where a number of main compounds with the highest concentrations are shown through the peak of the chromatogram as shown in Table 2.

In addition, the results of the analysis using GCMS contained compounds in the liver of rabbit fishes (*Siganus* sp.) shown in Fig. 3.

The number of compounds with the highest concentration is shown through several chromatogram peaks as shown in Table 3.

Discussion

Formamide, which is also known as methanamide, is an amide derived from formic acid, wherein the flesh of rabbit fishes (*Siganus* sp.) is found in a concentration of 13.09%, and skin rabbit fishes (*Siganus* sp.) with a concentration of 8.34%. The compound is a chemical raw material in the manufacture of sulfa drugs, other medicines, herbicides, pesticides and the manufacture of hydroxylic acid. In addition, it is used as a softener for paper and fiber, and several ionic compounds, as well as solvents for resins and plasticizers whereas Methanethiol compound with a concentration of 9.07% is mainly used in producing methionine which is used as a component of poultry food and animal feed [9]. While in the plastics industry as a moderator for free radical polymerization and became a pioneer in the manufacture of pesticides.⁷

Moreover, methenamine also known as hexamine or urotropin, is a heterocyclic organic compound with the formula (CH₂)₆N₄. The compound is in the flesh of rabbit fishes (*Siganus* sp.) with a concentration of 13.71%. These compounds are useful in the synthesis of other chemical compounds, e.g., plastics, pharmaceuticals, rubber additives. It sublimates in vacuum at 280 °C. The dominant use of hexamethylenetetramine is in the production of powdery or liquid preparations of phenolic resins and phenolic resin molding compounds, where it is added as a hardening component. These products are used as binders, e.g. in brake and clutch linings, abrasive products, non-woven textiles, formed parts produced by molding processes, and fireproof materials. It has been proposed that hexamethylenetetramine could work as a molecular building block for self-assembled molecular crystals.⁸

In the skin of rabbit fishes (*Siganus* sp.) there are also methyl maltol compounds with a concentration of 14.36%, and 1,4-diaza-2,5-dioxobicyclo[4.3.0]nonane with a concentration of 17.07%.

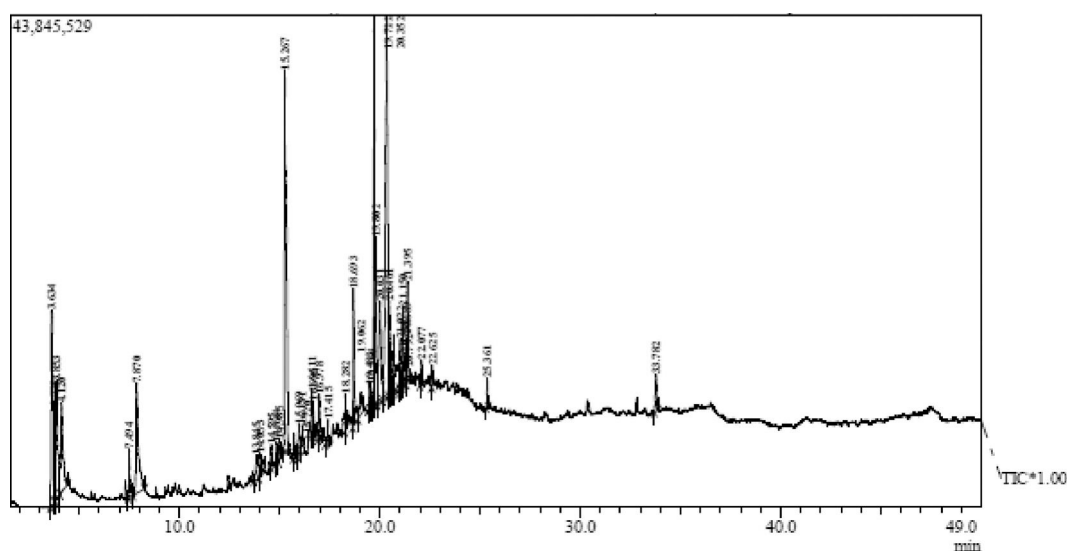


Fig. 2. GCMS chromatogram (TIC) obtained from skin rabbit fishes (*Siganus* sp.).

Table 2

Three major compounds of the chromatographic fraction of skin rabbit fishes (*Siganus* sp.) using GCMS analysis.

Peak	R. time	Area	Conc. (%)	Name
1	3.634	125 063 011	8.34	Formamide (CAS) methanamide
12	15.267	215 492 849	14.36	4H-Pyran-4-one,3-hydroxy-2,6-dimethyl-(CAS)methyl maltol
28	20.352	256 104 658	17.07	1,4-Diaza-2,5-dioxobicyclo[4.3.0]nonane

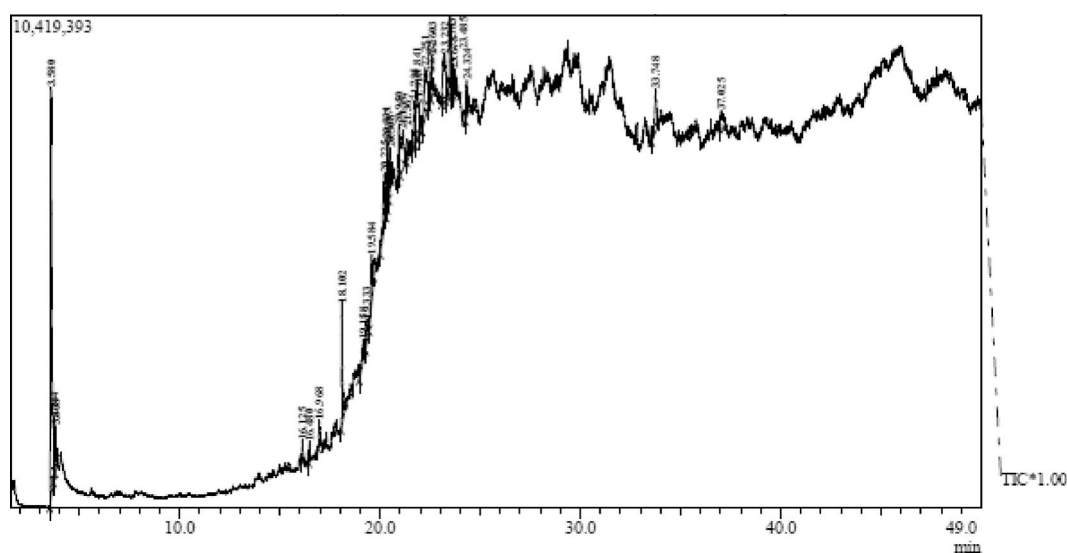


Fig. 3. GCMS chromatogram (TIC) obtained from of liver rabbit fishes (*Siganus* sp.).

Table 3

Three major compounds of the chromatographic fraction of liver rabbit fishes (*Siganus* sp.) using GCMS analysis.

Peak	R. time	Area	Conc %	Name
1	3.580	44 479 207	24.77	Carbamic acid, monoammonium salt (CAS) ammonium carbamate
21	22.251	10 737 951	5.98	Dodecanoic acid
25	23.485	11 635 769	6.48	Keton

Maltol is a natural organic compound that is used primarily as a flavor enhancer. Because it has the aroma of cotton candy and caramel, maltol is used to give fragrance to fragrances, maltol has been reported to greatly increase aluminum uptake in the body. and to increase the bioavailability of oral gallium and iron. This is known in the European E number food additive series as E636.

Whereas 1,4-diaza-2,5-dioxobicyclo[4.3.0]nonane as an antimicrobial fraction.^{9,10}

In the liver of rabbit fishes (*Siganus* sp.) There are Ammonium carbamate compounds with a concentration of 24.77%, Dodecanoic acid with a concentration of 5.98%, and ketones with a concentration of 6.48%. Ammonium carbamate has the ability to make

urea through the heating process of ammonium carbamate.^{11,12} Ammonium carbamate has also been approved by the Environmental Protection Agency as an inert ingredient in the formulation of aluminum phosphide pesticides.

Conclusion

The concentration of compounds in flesh, skin, and liver in rabbitfish (*Siganus* sp.) can be identified using Pyrolysis Gas Chromatography-Mass Spectroscopy (Py-GCMS) where there are a number of compounds that are very useful, but for its development further research is still needed.

Conflict of interest

The authors declare no conflict of interest.

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