MINERAL COMPOSITION OF *ENGRAULIS ENCRASICOLUS*

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Abstract
This study was designed to control the mineral content of Anchovy (*Engraulis encrasicolus*) which is one of most important species of Turkey seas. The mineral content was determined in muscle and viscera. According to findings, anchovy, caught for consume from Marmara and Black sea in Turkey, was found to be in ranged of International standards.

Keywords: Bio-accumulation, Black Sea, Macroelements, Monitoring, Trace elements

Introduction
Anchovy (*Engraulis encrasicolus*) is a pelagic and migrating species that constitutes the major biomass of Black sea. Anchovy feeds with phytoplankton and zooplankton in pelagic water. The feeding behavior of this species is resulted to accumulate of trace elements found in planktons or sea water where they go through. Metal accumulation is mainly occurred in muscle and some intestinal organs. Main living area of anchovy is well known to be as Black Sea in Turkey due to suitable water temperature, salinity and nutritional reservesfor their early and adult life stages. However, Black sea is bordered six riparian countries and affected many chemical pollutants carried by industrial rivers such as Danube and Dniester [1]. Thus, monitoring metal content in water columns and biomass in Black Sea can be considered as food safety and ecological evolution concerns. In this case, anchovy is one of the most important biomonitoring materials due to constituting majority of biomass in Black sea.

Materials and Methods
Samples were collected from fish boats, which fishes from Black Sea, in March 2014. Meat and viscera of anchovy samples divided into two groups and analyzed to determine mineral composition. Analyses were done according to the method of EPA [2],[3].

Results and Discussion
Calcium, magnesium, potassium, sodium, phosphorous, and iron were determined above than 1 mg/kg (Table 1). These elements were found to be statically different between meat and viscera. Among other minerals, cadmium, cobalt, lead tin and zinc were not determined in any samples.

Tab. 1. Mineral Content of Anchovy (mg/kg)

Mineral	Symbol	Meat	Viscera
Phosphorous	P	2282±151	6170±393
Sodium	Na	1057±24	1686±35
Magnesium	Mg	337±60	483±17
Potassium	K	3337±67	2373±58
Calcium	Ca	925±59	9809±1103
Iron	Fe	6,3±0,8	26,2±0,4
Aluminum	Al	0,92±0,08	3,93±0,28
Arsenic	As	0,84±0,03	0,95±0,02
Boron	B	0,72±0,02	0,75±0,03
Chromium	Cr	0,09±0,03	0,75±0,03
Copper	Cu	0,88±0,01	1,05±0,10
Manganese	Mn	0,34±0,08	1,95±0,03
Nickel	Ni	0,64±0,48	0,15±0,08
Selenium	Se	0,17±0,00	0,29±0,02
*Determination levels (mg/kg): Cadmium (Cd): 0,027; Cobalt (Co): 0,15; Lead (Pb): 0,076; Tin (Sn): 4,94; Zinc (Zn): 0,03.			

These metals are known to be discharges of industrial plants and can behazardous at high levels. Long term exposure of livings to these metals causes accumulation at higher concentrations. According to findings, anchovy samples, apparently, were not exposed to these metals via either feeding or living environments. Along with this, some of toxic metals such as arsenic and nickel were found at low amounts (<1mg/kg) and were not exceed the threshold levels indicated by international organizations [4],[5],[6]. However, such metals can be dangerous at low levels, so they should be closely monitored with water samples and other biomaterials.

Conclusion
This study has shown that the metal contamination levels of livings in Black Sea can be considered as safe. This study has shown that the metal contamination levels of livings in Black Sea can be considered as safe. However different biosamples and their parts along with waters should be monitored closely to ensure safety of seafood and ecological evolution in Black Sea.

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