

# The effect of ultrasonication temperature on snakehead fish (*Channa striata*) dispersion

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**Submission date:** 28-Nov-2021 04:42AM (UTC+0700)

**Submission ID:** 1713780843

**File name:** iar\_2020\_IOP\_Conf.\_Ser.\_Earth\_Environ.\_Sci.\_486\_012056.pdf (324.96K)

**Word count:** 2312

**Character count:** 12685

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To cite this article: Rahmaniar *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **486** 012056

6

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## The effect of ultrasonication temperature on snakehead fish (*Channa striata*) dispersion

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**Abstract.** Dispersion of snakehead fish (*Channa striata*) is one of the development products from the supplement of snakehead fish. It is made for people who cannot consume supplements in pill form. The dispersion of snakehead fish that have been made before having a large particle size so that it was unstable. This research aimed to study the effect of ultrasonication temperature on snakehead fish dispersion. The making of snakehead fish dispersion was carried out with the ultrasonication method by *Powersonic 405* frequency 40kHz for 60 minutes with temperature treatment of 30°C, 45°C, and 60°C respectively. The result shows that the temperature of ultrasonication has the effect of the ratio of phase separation and an increase in total dissolved solids.

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### 1. Introduction

Snakehead fish (*Channa striata*) is a freshwater fish found in Asian country especially in Indonesia. It has been known to have medicinal properties and beneficial for health for the people a long time ago. In the clinical aspect, snakehead fish has been associated as a drug because it has been clinically proven to help the recovery process in postoperative patients [1,2] burn patients [3] and provide different effects for wound patients [4,5].

Snakehead fish has a high protein that more than 15-20% is albumin [6] and it has 62.9% albumin extraction if done by its isoelectric point [7]. The composition of snakehead fish especially have a high protein and complete amino acids make snakehead fish can be considered as a food supplement [8,9]. The processing of snakehead fish into a supplement is done so that it becomes more practical, efficient and effective in its utilization [2].

One of the development supplement products by using snakehead fish is dispersion snakehead fish. Dispersion is a liquid form that is made for people who cannot consume supplements in pill form. Liquid dispersion is widely used because of ease of use on children, infants, and adults who are difficult to swallow tablets or capsules [10].

The dispersion of snakehead fish products is also developed in the form of snakehead fish protein dispersion [11–13]. In 2018, the development of snakehead dispersion was also developed with the addition of honey. The raw material in the form of snakehead fish protein concentrate used is quite large, 60-80 mesh (177-250 micrometers) [14], so it becomes unstable which is indicated by the number has a lot of sediment, a large of phase separation, and a few of total dissolved solids.

Increasing the stability of the dispersion can be done by reducing particle size. The method of break the particles was carried out by ultrasonication/sonication. It is using ultrasound waves with



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frequencies above 20 kHz [15]. Ultrasound waves in breaking up particles had been researched on snakehead fish concentrate products [16] while for dispersion products, ultrasound waves have been investigated in nano-emulsification kawista [17] and producing a lycopene nanodispersion [18]. Until now, there has been no research that directly examines the effects of ultrasonication on snakehead fish dispersion supplements. Therefore in this study will be conducted to find out the effects of ultrasonication temperature on snakehead fish dispersion.

## 2. Materials and methods

### 2.1. Materials

Materials used were Snakehead fish obtained from Borong fish market Makassar, water, honey, thickening agent, and tween 80.

### 2.2. Method

2.2.1. *Snakehead fish dispersion making.* Snakehead fish dispersion was made by mixing the concentrate of snakehead fish with all materials; water, honey, and thickening agent. They were put in a glass bottle and homogenized by using Ultraturax T 25 (IKA) [14].

2.2.2. *Ultrasound giving to snakehead fish dispersion.* Snakehead dispersion was given an ultrasound treatment by using ultrasonic (Easy Elmasonic 100H), with frequency 40 kHz for 60 minutes with a temperature of 30°C, 45°C, and 60°C respectively, then added tween 80 and homogenized.

2.2.3. *Total dissolved solids.* Total dissolved solids measurement was done by using a refractometer. The prism of the refractometer was first rinsed using distilled water and dried. Samples were dropped onto the Prisma of a refractometer and the degree of Brix [19].

2.2.4. *The ratio of Phase Separation.* Samples were measured for phase separation by comparing the initial height of the dispersion (H0) with the phase height separated (H1) after 1 day then recorded in units of cm [20].

## 3. Results and discussion

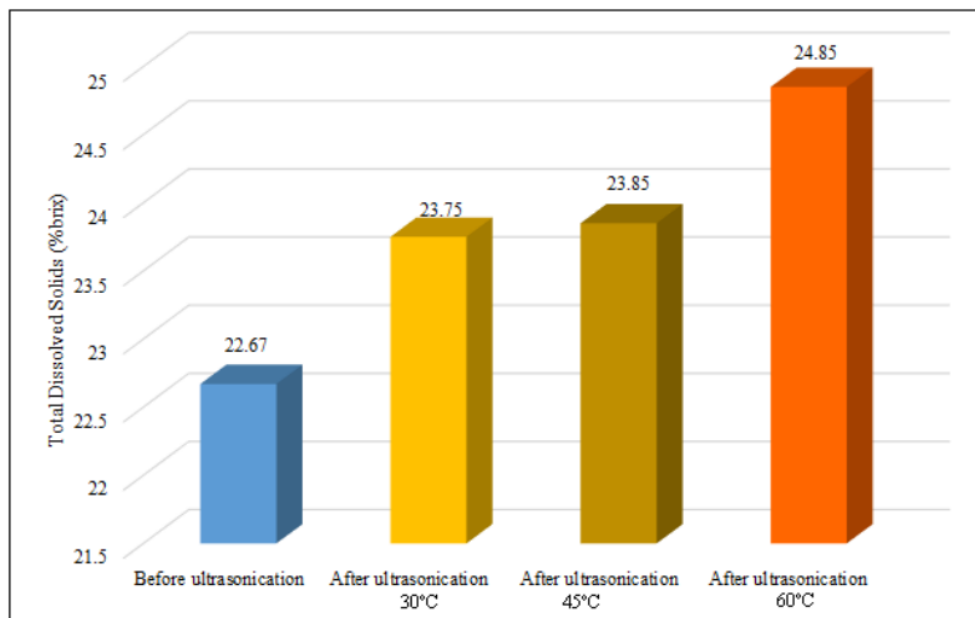
Dispersion is used in the current to describe the process of making a liquid in which particles are homogeneously distributed through the fluid phase continuously [21]. Dispersion is a system that shows a substance is finely divided into another substance. Substances that are divided or dispersed are called dispersed phases, internal phases, or discontinuous phases, while substances used to disperse are called dispersing phases, external phases, or continuous phases. The dispersing phase is better known as the dispersing medium [22].

The stability of the dispersion is one of the most important aspects of the dispersion. The stability of the dispersion system can be seen from the dispersion of a phase small particles to all the other phases which result in a wide contact area between the two phases. One of the factors that affect the stability of dispersion is particle size. The stability of the dispersion can be assessed from the total dissolved solids and the ratio of phase separation

Ultrasonication/sonication is a method of using ultrasound waves with frequencies above 20 kHz [15]. It can break the particle becomes smaller.

### 4.1. Total dissolved solids

Total dissolved solids are measures of the combined content of all organic and organic matters or salts that are found in water [23]. The results of the total dissolved solids of snakehead fish dispersion before and after getting ultrasound wave with various temperatures can be seen in figure 1.



**Figure 1.** Total dissolved solids of snakehead fish dispersion.

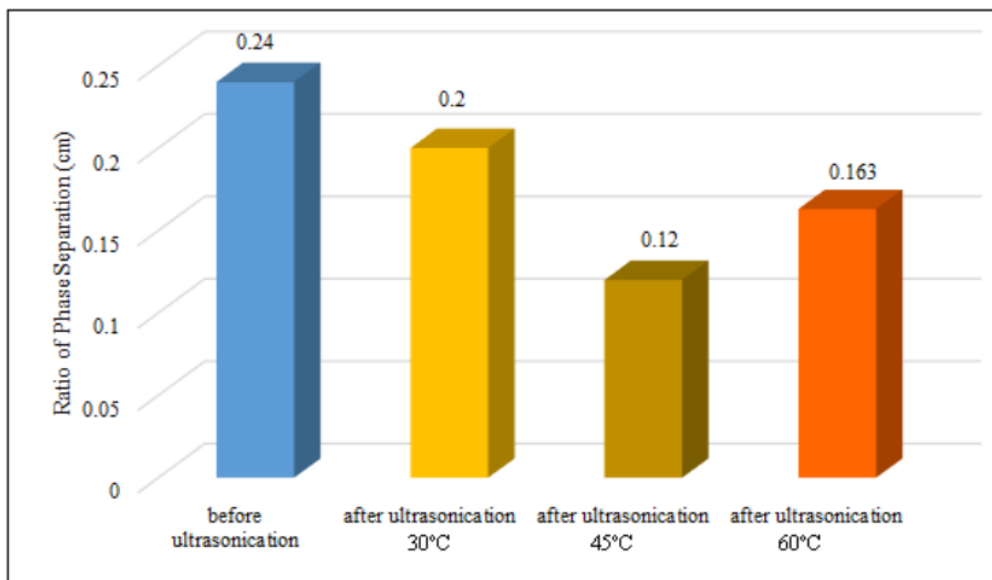
The results of the analysis of the total dissolved solids show that there is an increase in the total dissolved solids after the ultrasonication process. Total dissolved solids also increase with temperature. The highest total dissolved solids were 24.85% Brix obtained from 60°C temperature ultrasonication treatment.

The ultrasonication process had a cavitation effect that can break the particles becomes smaller by splitting the bubble. The smaller particle has a high solubility so that increases the total dissolved solids in dispersion. This is in accordance with Sun *et al.* [24], which states that particle size gives effect to solubility. The disjoining pressure of small particles is greater than that of large particles, so small particles have a higher interfacial solubility. Due to their higher differential concentration, thinner diffusion layer, and increased surface area, and making small particles is faster dissolved.

### 3.2. The ratio of phase separation

Phase separation is the high ratio of the dispersed substance (precipitate) to the original height before precipitation occurs. Phase separation is one of the assessments of dispersion stability. In this study, the phase separation ratio is done by storing snakehead fish dispersion for one day.

Figure 2 shows the ratio of phase separation with ultrasonication on various temperatures on snakehead fish dispersion. The result shows that the treatment of ultrasonication waves with a frequency of 40kHz can decrease the phase separation ratio. The effect of temperature shows that temperature also affects the ratio of phase separation, in which the lowest phase separation ratio is 0.12 cm at the ultrasonication with temperature 45°C.



**Figure 2.** The ratio of phase separation on snakehead fish dispersion.

The decreasing ratio of phase separation shows that snakehead fish dispersion is more stable. This is in accordance with Mahendradatta *et al.* [10], which states that the lower the phase separation indicated a better product of dispersion because the particles can be uniformly dispersed in the dispersing medium.

#### 4. Conclusions

The snakehead fish dispersion was carried out with the ultrasonication method by using various temperatures. Based on the result, the ultrasound with frequency 40 kHz gives an effect of increasing the total dissolved solids and decreasing ratio of phase separation. An increase in temperature also increases the total dissolved solids and effects on the phase separation ratio.

#### 5. Acknowledgment

This research was funded by the Directorate General of Research and Development, Ministry of Research, Technology and Higher Education, the Republic of Indonesia through Thesis Magister research.

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